Major Stormwater Management Plan
(Major SWMP)
For
Otay Business Park, TM 5505R

Preparation/Revision Date:
June 27, 2014

Env. Log No. PDS2014-ER-9319006WW
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Prepared for:

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The selection, sizing, and preliminary design of stormwater treatment and other control measures in this plan have been prepared under the direction of the following Registered Civil Engineer and meet the requirements of Regional Water Quality Control Board Order R9-2007-0001 and subsequent amendments.

Mark E. Stevens, RCE #35502

REGISTERED PROFESSIONAL ENGINEER
MARK E. STEVENS
No. 35502
Exp. 09-30-15
CIVIL
STATE OF CALIFORNIA

6/26/14
Date

The Major Stormwater Management Plan (Major SWMP) must be completed in its entirety and accompany applications to the County for a permit or approval associated with certain types of development projects. To determine whether your project is required to submit a Major or Minor SWMP, please reference the County's Stormwater Intake Form for Development Projects.

Project Name:	OTAY BUSINESS PARK
Project Location:	SE CORNER OF AIRWAY RD. AND ALTA RD.
Permit Number (Land Development Projects):	TM5505R
Work Authorization Number (**CIP only**):	
Applicant:	OTAY BUSINESS PARK, LLC Contact: Ricardo Jinich
Applicant's Address:	4370 LA JOLLA VILLAGE DR, SUITE 640 SAN DIEGO, CA 92122
Plan Prepared By (*Leave blank if same as applicant*):	STEVENS CRESTO ENGINEERING INC.
Preparer's Address:	9665 CHESAPEAKE DR., SUITE 200 SAN DIEGO, CA 92123
Date:	01/31/14

The County of San Diego Watershed Protection, Storm Water Management, and Discharge Control Ordinance (WPO) (Ordinance No. 9926) requires all applications for a permit or approval associated with a Land Disturbance Activity to be accompanied by a Storm Water Management Plan (SWMP) (section 67.806.b). The purpose of the SWMP is to describe how the project will minimize the short and long-term impacts on receiving water quality. Projects that meet the criteria for a priority development project are required to prepare a Major SWMP.

Since the SWMP is a living document, revisions may be necessary during various stages of approval by the County. Please provide the approval information requested below.

Project Stages	Does the SWMP need revisions?		If YES, Provide Revision Date	County Reviewer
	YES	NO		
TM-5505R	X		06/27/14	

Instructions for a Major SWMP can be downloaded at
http://www.sdcounty.ca.gov/dpw/watersheds/susmp/susmp.html

Completion of the following checklists and attachments will fulfill the requirements of a Major SWMP for the project listed above.

STEP 1

PRIORITY DEVELOPMENT PROJECT DETERMINATION

TABLE 1: IS THE PROJECT IN ANY OF THESE CATEGORIES?

Yes ❑	No ■	A	Housing subdivisions of 10 or more dwelling units. Examples: single-family homes, multi-family homes, condominiums, and apartments.
Yes ■	No ❑	B	Commercial—greater than one acre (total disturbed area). Any development other than heavy industry or residential. Examples: hospitals; laboratories and other medical facilities; educational institutions; recreational facilities; municipal facilities; commercial nurseries; multi-apartment buildings; car wash facilities; mini-malls and other business complexes; shopping malls; hotels; office buildings; public warehouses; automotive dealerships; airfields; and other light industrial facilities.
Yes ❑	No ■	C	Heavy industry—greater than one acre (total disturbed area). Examples: manufacturing plants, food processing plants, metal working facilities, printing plants, and fleet storage areas (bus, truck, etc.).
Yes ❑	No ■	D	Automotive repair shops. A facility categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539.
Yes ❑	No ■	E	Restaurants. Any facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812), where the land area for development is greater than 5,000 square feet. Restaurants where land development is less than 5,000 square feet shall meet all SUSMP requirements except for structural treatment BMP and numeric sizing criteria requirements and hydromodification requirements.
Yes ❑	No ■	F	Hillside development greater than 5,000 square feet. Any development that creates 5,000 square feet of impervious surface and is located in an area with known erosive soil conditions, where the development will grade on any natural slope that is twenty-five percent or greater.
Yes ❑	No ■	G	Environmentally Sensitive Areas (ESAs). All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA. "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.
Yes ❑	No ■	H	Parking lots 5,000 square feet or more or with 15 or more (paved) parking spaces and potentially exposed to urban runoff.
Yes ■	No ❑	I	Street, roads, highways, and freeways. Any paved surface that is 5,000 square feet or greater used for the transportation of automobiles, trucks, motorcycles, and other vehicles.
Yes ❑	No ■	J	Retail Gasoline Outlets (RGOs) that are: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.

To use the table, review each definition A through K. If any of the definitions match, the project is a Priority Development Project. Note some thresholds are defined by square footage of impervious area created; others by the total area of the development. Please see special requirements for previously developed sites and project exemptions on page 6 of the County SUSMP.

STEP 2

PROJECT STORMWATER QUALITY DETERMINATION

Total Project Site Area: Approx. 176 Ac.

Estimated amount of disturbed acreage: Approx. 176 Ac.

(If >1 acre, you must also provide a WDID number from the SWRCB) WDID: Will be provided prior to permit issuance

Complete A through C and the calculations below to determine the amount of impervious surface on your project before and after construction.

A. **Total size of project site:** 176 Ac.

B. **Total impervious area (including roof tops) before construction:** ~0 Ac.

C. **Total impervious area (including roof tops) after construction:** 98 Ac.

Calculate percent impervious before construction: (B/A)*100 = <1%
Calculate percent impervious after construction: (C/A)*100 = 56%

Please provide detailed descriptions regarding the following questions:

TABLE 2: PROJECT SPECIFIC STORMWATER ANALYSIS

1.	Please provide a brief description of the project.

The Otay Business Park is a 161.6 gross acre parcel located immediately southeast of and adjacent to the future intersection of Alta Road and Airway Road in East Otay Mesa, San Diego County, California. The property also lies immediately north of the U.S./Mexico border approximately 0.5 mile east of Enrico Fermi Drive. The project site consists of a single parcel (Assessor's Parcel Number 648-070-21), and is located within Subarea 2 of the East Otay Mesa Specific Plan (EOMSP) area.

The proposed development consists of 34 lots varying in size, and two detention basins. Access to Otay Business Park will be primarily from Alta Road along the west of the property line. Siempre Viva Road will be extended from the west and will pass through the property for future connection, and continuation, to the northeast. Several roads will be constructed interior to the project for lot access. Offsite roadway improvements include the extension of Airway Road and Siempre Viva Road from Airway Place to the project boundary. Otay Business Park will be constructed in three units.

Development of the project site includes the extension of water, sewer, and storm drain lines into the project area. Detention basins in the southeastern and southwestern portions of the property have been designed to provide peak flow and hydromodification mitigation for the entire project in ultimate build-out condition; see the Drainage Study for Otay Business Park for peak flow calculations, and Appendix H for hydromodification calculations. Discharge points will remain consistent with existing conditions south of the site and enter existing (6) 7' wide x 4' high box culverts that travels across the border into Mexico.

Peak flow and hydromodification calculations for the subdivision assume ultimate commercial build out of the proposed lots. During the Site Plan review of each proposed on-lot development, the development will need to demonstrate conformance to the assumed runoff coefficients, and will need to propose appropriate on-lot pollution control BMPs. No site plans are proposed at this time.

2.	Describe the current and proposed zoning and land use designation.

Existing and proposed zoning are S-88, Specific Plan. The Otay Mesa Specific Plan allows for "Mixed Industrial" use within the project boundary.

3.	Describe the pre-project and post-project topography of the project. (Show on Plan)

The project site, in its existing condition, is undeveloped property consisting of undisturbed natural terrain that is situated within two distinct drainage basins, draining north to south. Runoff passing through the site flows south across the border into Mexico and ultimately to the Tijuana River (Tijuana River Watershed). The proposed project will maintain existing drainage patterns and discharge points to the maximum extent practicable. See the Preliminary Grading Plan in Attachment A for existing and proposed topography.

4.	Describe the soil classification, permeability, erodibility, and depth to groundwater for LID and Treatment BMP consideration. (Show on Plan) If infiltration BMPs are proposed, a Geotechnical Engineer must certify infiltration BMPs in Attachment E.
Per the San Diego County Hydrology Manual, Hydrologic Soil Groups Map, the site is dominated by Hydrologic Soil Group D. Group D soils have very slow infiltration rates when thoroughly wetted. Consisting primarily of clay soils with a high swelling potential, soils with a high permanent water table, soils with clay pan layer at or near the surface, and shallow soils over nearly impervious materials such as rock, Group D soils have a very slow rate of water transmission. As such, infiltration BMPs are not proposed for use at the site.	
5.	Describe if contaminated or hazardous soils are within the project area. (Show on Plan)
There appear to be no hazardous or contaminated soils within the project area.	
6.	Describe the existing site drainage and natural hydrologic features. (Show on Plan).
Two major drainages pass north-south through the project site. Per the project Drainage Study for Otay Business Park, approximately 110 cfs of off-site run-on is tributary to the westerly drainage during a 100 year design storm. This off-site run-on will be collected within a bypass storm drain system for conveyance within Alta Road, and will be discharged at the southwest corner of the project. Approximately 499 cfs of off-site run-on is tributary to the easterly drainage during a 100-year design storm. This off-site run-on will pass through the project within a rock-lined graded channel before being discharged at the southeast corner of the project.	
7.	Describe site features and conditions that constrain, or provide opportunities for stormwater control, such as LID features.
The presence of type D silty and clayey soils at the project site constrains options for BMPs. Infiltration BMPs are not feasible and any future bio-retention facilities proposed will require underdrains and possibly impervious liners.	
8.	Is this project within the environmentally sensitive areas as defined on the maps in Appendix A of the *County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects?* **(See Figure 1 below)**
Yes	(No)
9.	Is this an emergency project?
Yes	(No)

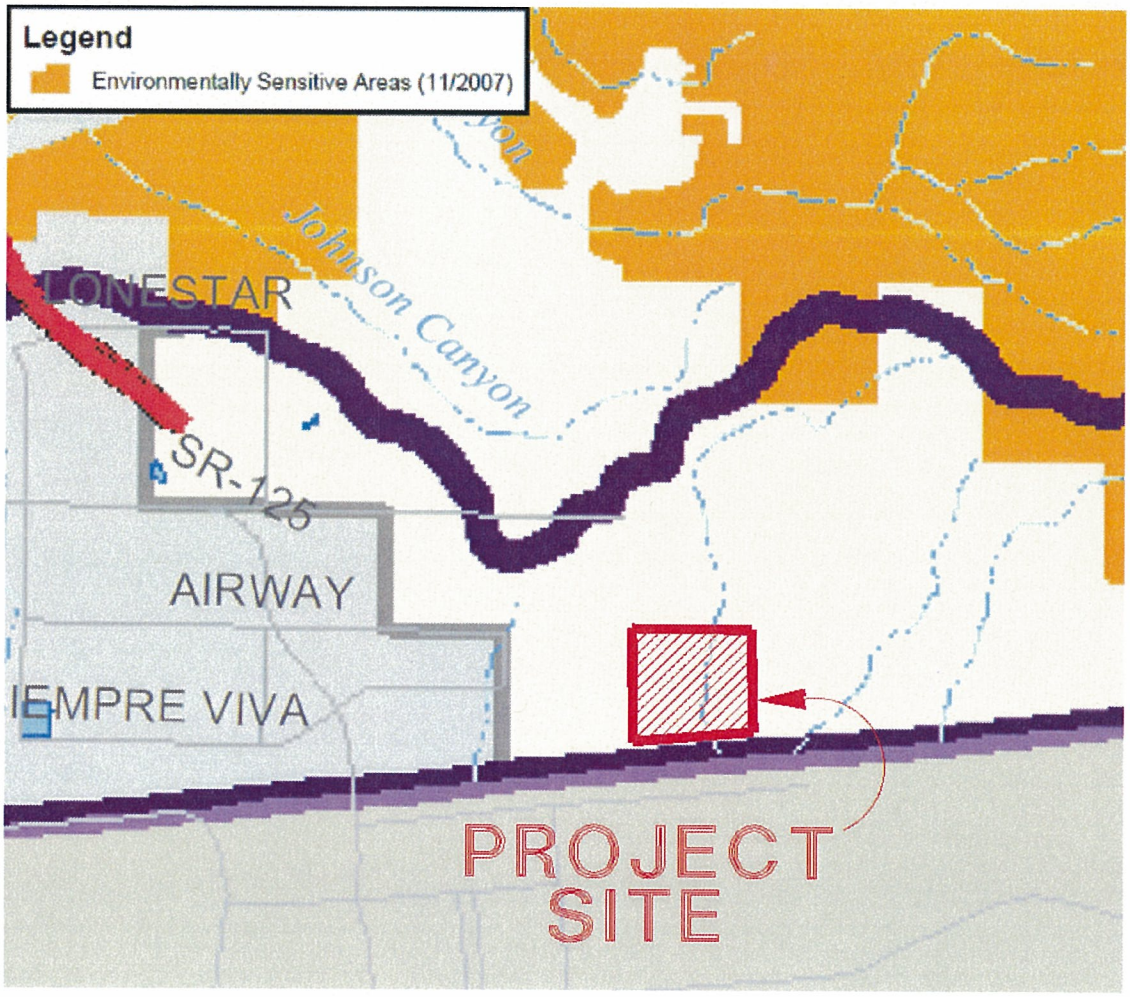


Figure 1
Portion of SUSMP Appendix A – Environmentally Sensitive Areas

CHANNELS & DRAINAGES

Complete the following checklist to determine if the project includes work in channels.

TABLE 3: CHANNEL& DRAINAGE ANALYSIS

No.	CRITERIA	YES	NO	N/A	COMMENTS
1.	Will the project include work in channels?	X*			If YES go to 2 If NO go to 13.
2.	Will the project increase velocity or volume of downstream flow?	X			If YES go to 6.
3.	Will the project discharge to unlined channels?		X		If YES go to. 6.
4.	Will the project increase potential sediment load of downstream flow?		X		If YES go to 6.
5.	Will the project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect downstream channel stability?		X		If YES go to 8.
6.	Review channel lining materials and design for stream bank erosion.	X			Continue to 7.
7.	Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity.	X			Continue to 8.
8.	Include, where appropriate, energy dissipation devices at culverts.	X			Continue to 9.
9.	Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour.	X			Continue to 10.
10.	Include, if appropriate, detention facilities to reduce peak discharges.	X			Continue to 11.
11.	"Hardening" natural downstream areas to prevent erosion is not an acceptable technique for protecting channel slopes, unless pre-development conditions are determined to be so erosive that hardening would be required even in the absence of the proposed development.			X	Continue to 12.
12.	Provide other design principles that are comparable and equally effective.		X		Continue to 13.
13.	End				

*No existing channels are present; the project will create a channel.

TEMPORARY CONSTRUCTION BMPS

Please check the construction BMPs that may be implemented during construction of the project. The applicant will be responsible for the placement and maintenance of the BMPs incorporated into the final project design.

- ■ Silt Fence
- ■ Fiber Rolls
- ■ Street Sweeping and Vacuuming
- ■ Storm Drain Inlet Protection
- ■ Stockpile Management
- ■ Solid Waste Management
- ■ Stabilized Construction Entrance/Exit
- ☐ Dewatering Operations
- ■ Vehicle and Equipment Maintenance
- ☐ Desilting Basin
- ■ Gravel Bag Berm
- ☐ Sandbag Barrier
- ■ Material Delivery and Storage
- ■ Spill Prevention and Control
- ■ Concrete Waste Management
- ■ Water Conservation Practices
- ■ Paving and Grinding Operations

- ■ Any minor slopes created incidental to construction and not subject to a major or minor grading permit shall be protected by covering with plastic or tarp prior to a rain event, and shall have vegetative cover reestablished within 180 days of completion of the slope and prior to final building approval.

EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

Complete the checklist below to determine if a proposed project will pose an "exceptional threat to water quality," and therefore require Advanced Treatment Best Management Practices during the construction phase.

TABLE 4: EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

No.	CRITERIA	YES	NO	INFORMATION
1.	Is all or part of the proposed project site within 200 feet of waters named on the Clean Water Act (CWA) Section 303(d) list of Water Quality Limited Segments as impaired for sedimentation and/or turbidity? Current 303d list may be obtained from the following site: http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/category5_report.shtml		X	If YES, continue to 2. If NO, go to 5.
2.	Will the project disturb more than 5 acres, including all phases of the development?		N/A	If YES, continue to 3. If NO, go to 5.
3.	Will the project disturb slopes that are steeper than 4:1 (horizontal: vertical) with at least 10 feet of relief, and that drain toward the 303(d) listed receiving water for sedimentation and/or turbidity?		N/A	If YES, continue to 4. If NO, go to 5.
4.	Will the project disturb soils with a predominance of USDA-NRCS Erosion factors k_f greater than or equal to 0.4? http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm		N/A	If YES, continue to 6. If NO, go to 5.
5.	Project is not required to use Advanced Treatment BMPs.	X		Document for Project Files by referencing this checklist.
6.	Project poses an "exceptional threat to water quality" and is required to use Advanced Treatment BMPs.		X	Advanced Treatment BMPs must be consistent with WPO section 67.811(b)(20)(D) performance criteria

Exemption potentially available for projects that require advanced treatment: Project proponent may perform a Revised Universal Soil Loss Equation, Version 2 (RUSLE 2), Modified Universal Soil Loss Equation (MUSLE), or similar analysis that demonstrates (to the County official's satisfaction) that advanced treatment is not required.

STEP 3

HYDROMODIFICATION DETERMINATION

The following questions provide a guide to collecting information relevant to hydromodification management plan (HMP) issues. If the project is exempt from the HMP criteria, please provide the supporting documentation in Attachment H. Please reference the full descriptions of the HMP exemptions located in Figure 1-1 of the County SUSMP.

TABLE 5: HYDROMODIFICATION DETERMINATION

	QUESTIONS	YES	NO	Information
1.	Will the project reduce the pre-project impervious area and are the unmitigated post-project outflows (outflows without detention routing) to each outlet location less as compared to the pre-project condition?		X	If NO, continue to 2. If YES, go to 7.
2.	Would the project site discharge runoff directly to an exempt receiving water, such as the Pacific Ocean, San Diego Bay, an exempt reservoir, or a tidally-influenced area?		X	If NO, continue to 3. If YES, go to 7.
3.	Would the project site discharge to a stabilized conveyance system, which has the capacity for the ultimate Q_{10}, and extends to the Pacific Ocean, San Diego Bay, a tidally-influenced area, an exempt river reach or reservoir?		X	If NO, continue to 4. If YES, go to 7.
4.	Does the contributing watershed area to which the project discharges have an impervious area percentage greater than 70 percent?		X	If NO, continue to 5. If YES, go to 7.
5.	Is this an urban infill project which discharges to an existing hardened or rehabilitated conveyance system that extends beyond the "domain of analysis," where the potential for cumulative impacts in the watershed are low, and the ultimate receiving channel has a "Low" susceptibility to erosion as defined in the SCCWRP channel assessment tool?		X	If NO, continue to 6. If YES, go to 7.
6.	Project is required to manage hydromodification impacts.	X		Reference Appendix G "Hydromodification Management Plan" of the County SUSMP.
7.	Project is not required to manage hydromodification impacts.		X	Hydromodification Exempt. Keep on file.

STEP 4

POLLUTANTS OF CONCERN DETERMINATION

WATERSHED

Please check the watershed(s) for the project.

☐ San Juan 901	☐ Santa Margarita 902	☐ San Luis Rey 903	☐ Carlsbad 904
☐ San Dieguito 905	☐ Penasquitos 906	☐ San Diego 907	☐ Sweetwater 909
☐ Otay 910	■ Tijuana 911	☐ Whitewater 719	☐ Clark 720
☐ West Salton 721	☐ Anza Borrego 722	☐ Imperial 723	

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

HYDROLOGIC SUB-AREA NAME AND NUMBER(S)

Number	Name
911.12	WATER TANKS

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

SURFACE WATERS that each project discharge point proposes to discharge to. List the impairments identified in Table 7.

SURFACE WATERS (river, creek, stream, etc.)	Hydrologic Unit Basin Number	Impairment(s) listed [303(d) listed waters or waters with established TMDLs]	Distance to Project
Tijuana River	911.11	Eutrophic, indicator bacteria, low dissolved oxygen, pesticides, phosphorus, sedimentation, selenium, solids, surfactants, synthetic organics, total nitrogen as N, toxicity, trace elements, trash	~7.5 Miles
Tijuana Estuary	911.11	Eutrophic, indicator bacteria, lead, low dissolved oxygen, nickel, pesticides, thallium, trash, turbidity	~12 Miles
Pacific Ocean Shoreline, Tijuana HU	911.11	Enterococcus, fecal coliform, total coliform	~13 Miles

http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303dlists2006/epa/r9_06_303d_reqtmdls.pdf

GROUND WATERS

Ground Water		Hydrologic Unit Basin Number	BENEFICIAL USE MUN	AGR	IND	PROC	FRSH	GWR
TIJUANA HYDROLOGIC UNIT		**11.00**						
Tijuana Valley	HA	11.10						
Water Tanks	HSA	11.12	O	O	O			

● Existing Beneficial Use

O Potential Beneficial Use

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

+ Excepted from Municipal ● Existing Beneficial Use ○ Potential Beneficial Use

2010 INTEGRATED REPORT — ALL ASSESSED WATERS

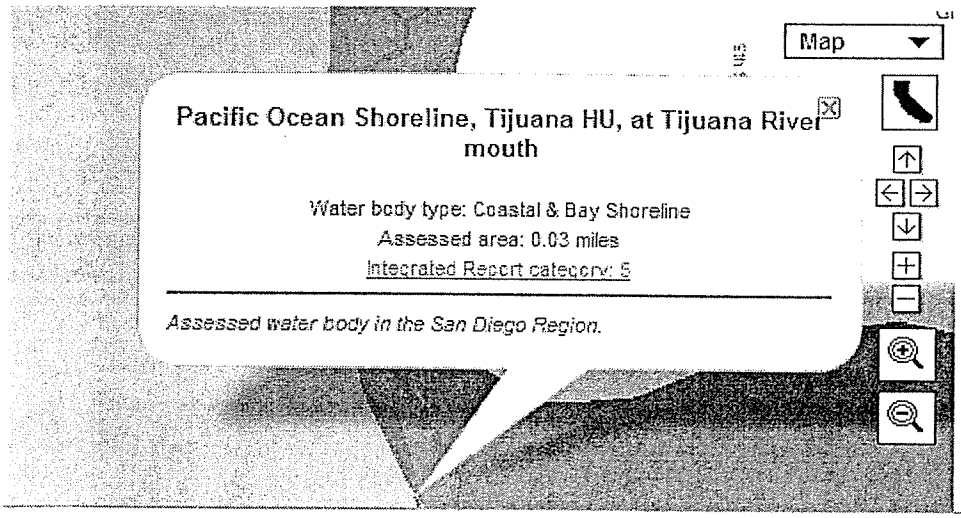
Zoom to county: San Diego ☐ Show county

Zoom to Regional Board: All ☐ Show Regional Board

Map Help

Zoom to water body: *(Filter: All)*

Filter list by: Reset list



Show all assessed waters

Show only impaired ("303(d)-listed") waters

Show water bodies by pollutant:

Pollutant category: *All*

All

Pollutant: *All*

Pollutant assessments for Pacific Ocean Shoreline, Tijuana HU, at Tijuana River mouth

Close

Pollutants	Listing Decision	Detailed Report	Potential Sources	Schedule
	Comments			
Enterococcus	Do Not Delist from 303(d) list (TMDL required list)	16888	Natural Sources, Source Unknown, Unknown Nonpoint Source, Urban Runoff/Storm Sewers	Est. TMDL completion: 2019
Fecal Coliform	Do Not Delist from 303(d) list (TMDL required list)	16889	Natural Sources, Source Unknown, Unknown Nonpoint Source, Urban Runoff/Storm Sewers	Est. TMDL completion: 2019
Total Coliform	Do Not Delist from 303(d) list (TMDL required list)	16890	Natural Sources, Source Unknown, Unknown Nonpoint Source, Urban Runoff/Storm Sewers	Est. TMDL completion: 2019

http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

2010 INTEGRATED REPORT — ALL ASSESSED WATERS

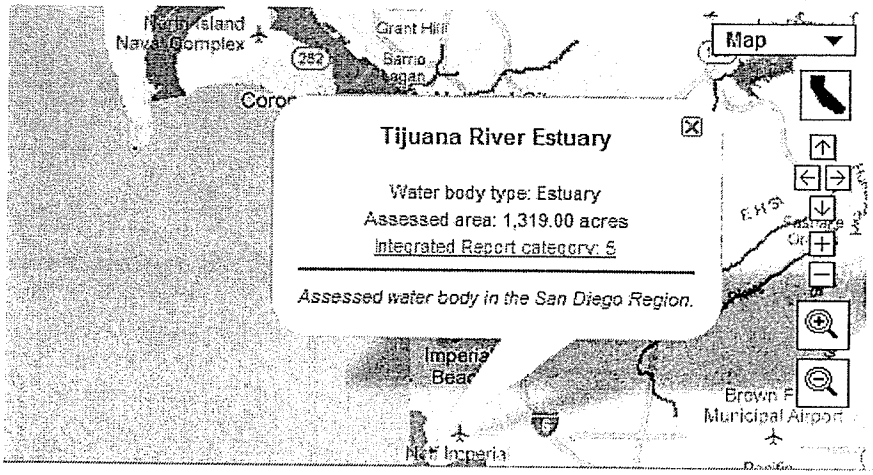
Zoom to county: San Diego ▾ Show county

Zoom to Regional Board: All ▾ Show Regional Board

Map Help

Zoom to water body: *(Filter: All)*

Filter list by: ▾ Reset list



- ◉ Show all assessed waters
- ○ Show only impaired ("303(d)-listed") waters

Show water bodies by pollutant:

Pollutant category: *All* ▾ All

Pollutant: *All*

Pollutant assessments for Tijuana River Estuary

Close

Pollutants	Listing Decision	Detailed Report	Potential Sources	Schedule
	Comments			
Eutrophic	List on 303(d) list (TMDL required list)	8844	Nonpoint Source, Point Source	Est. TMDL completion: 2019
	Estimated size of impairment is 1 acre.			
Indicator Bacteria	List on 303(d) list (TMDL required list)	8848	Nonpoint Source, Point Source	Est. TMDL completion: 2010
	Estimated size of impairment is 150 acres.			
Lead	List on 303(d) list (TMDL required list)	8116	Nonpoint Source, Point Source	Est. TMDL completion: 2019
	Estimated size of impairment is 1 acre.			
Low Dissolved Oxygen	Do Not Delist from 303(d) list (TMDL required list)	8872	Unknown Nonpoint Source, Unknown Point Source, Urban Runoff/Storm Sewers, Wastewater	Est. TMDL completion: 2019
Nickel	List on 303(d) list (TMDL required list)	8118	Nonpoint Source, Point Source	Est. TMDL completion: 2019
	Estimated size of impairment is 1 acre.			
Pesticides	List on 303(d) list (TMDL required list)	8159	Nonpoint Source, Point Source	Est. TMDL completion: 2019
	Estimated size of impairment is 1 acre.			
Thallium	List on 303(d) list (TMDL required list)	8181	Nonpoint Source, Point Source	Est. TMDL completion: 2019
	Estimated size of impairment is 1 acre.			
Trash	List on 303(d) list (TMDL required list)	8182	Nonpoint Source, Point Source, Urban Runoff/Storm Sewers	Est. TMDL completion: 2019
	Estimated size of impairment is 1 acre.			
Turbidity	List on 303(d) list (TMDL required list)	8831	Source Unknown	Est. TMDL completion: 2019

2010 INTEGRATED REPORT — ALL ASSESSED WATERS

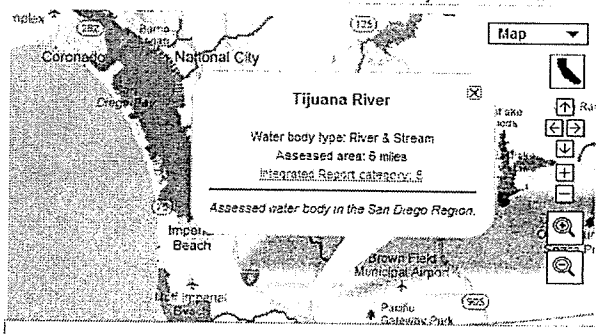
Zoom to county: San Diego ☐ Show county

Zoom to Regional Board: All ☐ Show Regional Board

Map Help

Zoom to water body: *(Filter: All)*

Filter list by: Reset list



Map

- ◉ Show all assessed waters
- ○ Show only impaired ("303(d)-listed") waters

Show water bodies by pollutant:

Pollutant category
All

All

Pollutant
All

Pollutant assessments for Tijuana River

Close

Pollutants	Listing Decision	Detailed Report	Potential Sources	Schedule
	Comments			
Eutrophic	List on 303(d) list (TMDL required list)	3293	Agriculture-animal, Onsite Wastewater Systems (Septic Tanks), Unknown Nonpoint Source, Unknown Point Source, Urban Runoff/Storm Sewers, Wastewater	Est. TMDL completion: 2019
Indicator Bacteria	List on 303(d) list (TMDL required list)	3259	Agriculture-animal, Onsite Wastewater Systems (Septic Tanks), Unknown Nonpoint Source, Unknown Point Source, Urban Runoff/Storm Sewers, Wastewater	Est. TMDL completion: 2010
Low Dissolved Oxygen	List on 303(d) list (TMDL required list)	3371	Agriculture-animal, Unknown Nonpoint Source, Unknown Point Source, Urban Runoff/Storm Sewers, Wastewater	Est. TMDL completion: 2019
Pesticides	List on 303(d) list (TMDL required list)	3362	Agriculture, Unknown Nonpoint Source, Urban Runoff/Storm Sewers	Est. TMDL completion: 2019
Phosphorus	List on 303(d) list (TMDL required list)	18317	Agriculture-animal, Municipal Point Sources, Nonpoint Source, Out-of-state source, Point Source	Est. TMDL completion: 2021
Sedimentation/Siltation	List on 303(d) list (TMDL required list)	19815	Channel Erosion, Erosion From Derelict Land, Erosion/Siltation, Natural Sources, Streambank Modification/Destabilization	Est. TMDL completion: 2021
Selenium	List on 303(d) list (TMDL required list)	15870	Natural Sources, Source Unknown	Est. TMDL completion: 2021
Solids	List on 303(d) list (TMDL required list)	3304	Unknown Nonpoint Source, Unknown Point Source, Urban Runoff/Storm Sewers	Est. TMDL completion: 2019
Surfactants (MBAS)	List on 303(d) list (TMDL required list)	18362	Nonpoint Source, Point Source	Est. TMDL completion: 2021
Synthetic Organics	List on 303(d) list (TMDL required list)	3308	Major Industrial Point Source, Nonpoint Source, Point Source, Urban Runoff/Storm Sewers	Est. TMDL completion: 2019
Total Nitrogen as N	List on 303(d) list (TMDL required list)	18816	Natural Sources, Source Unknown, Unknown Nonpoint Source, Urban Runoff/Storm Sewers	Est. TMDL completion: 2021
Toxicity	List on 303(d) list (TMDL required list)	16371	Unknown Nonpoint Source, Unknown Point Source, Urban Runoff/Storm Sewers	Est. TMDL completion: 2021
Trace Elements	List on 303(d) list (TMDL required list)	8836	Nonpoint Source, Point Source	Est. TMDL completion: 2019
Trash	List on 303(d) list (TMDL required list)	8341	Nonpoint Source, Point Source	Est. TMDL completion: 2019

PROJECT ANTICIPATED AND POTENTIAL POLLUTANTS

Using Table 6, identify pollutants that are anticipated to be generated from the proposed priority project categories. Pollutants associated with any hazardous material sites that have been remediated or are not threatened by the proposed project are not considered a pollutant of concern.

TABLE 6: ANTICIPATED AND POTENTIAL POLLUTANTS GENERATED BY LAND USE TYPE

	General Pollutant Categories								
PDP Categories	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P(1)	P(2)	P	X
Commercial Development 1 acre or greater	P(1)	P(1)		P(2)	X	P(5)	X	P(3)	P(5)
Heavy industry /industrial development	X		X	X	X	X	X		
Automotive Repair Shops			X	X(4)(5)	X		X		
Restaurants					X	X	X	X	
Hillside Development >5,000 ft²	X	X			X	X	X		X
Parking Lots	P(1)	P(1)	X		X	P(1)	X		P(1)
Retail Gasoline Outlets			X	X	X	X	X		
Streets, Highways & Freeways	X	P(1)	X	X(4)	X	P(5)	X		

X = anticipated
P = potential
(1) A potential pollutant if landscaping exists on-site.
(2) A potential pollutant if the project includes uncovered parking areas.
(3) A potential pollutant if land use involves food or animal waste products.
(4) Including petroleum hydrocarbons.
(5) Including solvents.

PROJECT POLLUTANTS OF CONCERN SUMMARY TABLE

Please summarize the identified project pollutants-of-concern by checking the appropriate boxes in the table below and list any surface water impairments identified. Pollutants anticipated to be generated by the project, which are also causing impairment of receiving waters, shall be considered the primary pollutants of concern. For projects where no primary pollutants of concern exist, those pollutants identified as anticipated shall be considered secondary pollutants of concern.

TABLE 7: PROJECT POLLUTANTS OF CONCERN

Pollutant Category	Anticipated (X)	Potential (P)	Surface Water Impairments	
Sediments	X		X (Sedimentation)	**Primary**
Nutrients		X	X (Phosphorus, Eutrophic)	**Primary**
Heavy Metals	X		X (Lead, nickel, thallium)	**Primary**
Organic Compounds	X		X (Synthetic organics)	**Primary**
Trash & Debris	X		X (Solids, trash)	**Primary**
Oxygen Demanding Substances		X	X (Low dissolved oxygen)	**Primary**
Oil & Grease	X			**Secondary**
Bacteria & Viruses		X	X (Indicator bacteria)	**Primary**
Pesticides		X	X (Pesticides)	**Primary**

Primary and secondary pollutants are determined by assessing the anticipated and potential pollutants to be generated by the proposed project, and by comparing those to the impairments in the downstream receiving waters. Pollutants anticipated to be generated by the project, which are also causing impairment of receiving waters, shall be considered the primary pollutants of concern. Pollutants anticipated to be generated by the project, which are not currently causing impairment of receiving waters, shall be considered the secondary pollutants of concern. The Tijuana River and Tijuana Estuary are impaired by eutrophic, an indicator of excessive nutrients and, as a result, nutrients are a primary pollutant of concern. The Tijuana Estuary is impaired by lead, nickel, and thallium, and, as a result, heavy metals are a primary pollutant of concern. The Tijuana River and Tijuana Estuary are impaired by trash, and the river is impaired by solids, and, as a result, trash and debris are primary pollutants of concern. The Tijuana River and Tijuana Estuary are impaired by low dissolved oxygen, an indicator of oxygen demanding substances and, as a result, oxygen demanding substances are a primary pollutant of concern. The Tijuana River and Tijuana Estuary are impaired by pesticides and, as a result, pesticides are a primary pollutant of concern. The Tijuana River and Tijuana Estuary are impaired by indicator bacteria, and as a result, bacteria is a primary pollutant of concern. The Tijuana River is impaired by sedimentation and solids, and as a result, sediments are a primary pollutant of concern. Additional anticipated pollutants, which the downstream receiving waters are not impacted by, are oil & grease; these are secondary pollutants of concern.

STEP 5

LID AND SITE DESIGN STRATEGIES

Each numbered item below is a Low Impact Development (LID) requirement of the WPO. Please check the box(s) under each number that best describes the LID BMP(s) and Site Design Strategies selected for this project. LID BMPs selected on this table will be typically represented as a self-retaining area, self-treating area, pervious pavement and greenroof, which, should be delineated in the Drainage Management Area map in Attachment C.

TABLE 8: LID AND SITE DESIGN

1. Conserve natural Areas, Soils, and Vegetation
☐ Preserve well draining soils (Type A or B)
☐ Preserve Significant Trees

☐ Preserve critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions

■ Other. Description: A drainage channel designed to mimic the existing conditions will transect the eastern half of the project site from north to south.

2. Minimize Disturbance to Natural Drainages
☐ Set-back development envelope from drainages
■ Restrict heavy construction equipment access to planned green/open space areas

☐ Other. Description:

3. Minimize and Disconnect Impervious Surfaces (see 5)
■ Clustered Lot Design
☐ Items checked in 5?

■ Other. Description: Though the proposed project will employ LID site design principals to the Maximum Extent Practicable (MEP), LID design options are limited at this stage in development since the project will only construct streets and rough graded pads. Ultimate LID site design strategies will be implemented during the development of each lot and will be determined during the Site Plan Review performed prior to the development of each lot, as mandated by the Specific Plan.

4. Minimize Soil Compaction
■ Restrict heavy construction equipment access to planned green/open space areas.
■ Re-till soils compacted by construction vehicles/equipment
■ Collect & re-use upper soil layers of development site containing organic Materials

☐ Other. Description:

5. Drain Runoff from Impervious Surfaces to Pervious Areas
LID Street & Road Design
■ Curb-cuts to landscaping (where feasible)
☐ Rural Swales
☐ Concave Median

☐ Cul-de-sac Landscaping Design

■ Other. Description: Public roadways have been designed to minimum required widths. Runoff generated by the roadways will be treated through the use of structural treatment control BMPs and then routed through unlined extended detention basins.

LID Parking Lot Design
☐ Permeable Pavements
☐ Curb-cuts to landscaping

■* Other. Description: To be determined during the ultimate development of each lot.

LID Driveway, Sidewalk, Bike-path Design
☐ Permeable Pavements
☐ Pitch pavements toward landscaping

■* Other. Description: To be determined during the ultimate development of each lot.

LID Building Design
☐ Cisterns & Rain Barrels
☐ Downspout to swale or landscaping
☐ Vegetated Roofs

■* Other. Description: To be determined during the ultimate development of each lot.

LID Landscaping Design
☐ Soil Amendments
☐ Reuse of Native Soils
☐ Smart Irrigation Systems
■* Street Trees: To be determined during the ultimate development of each lot.

☐ Other. Description:

6. Minimize erosion from slopes
■ Disturb existing slopes only when necessary
■ Minimize cut and fill areas to reduce slope lengths
☐ Incorporate retaining walls to reduce steepness of slopes or to shorten slopes
☐ Provide benches or terraces on high cut and fill slopes to reduce concentration of flows

☐ Rounding and shaping slopes to reduce concentrated flow

■ Collect concentrated flows in stabilized drains and channels

☐ Other. Description:

***BMP is anticipated for use at the project during the ultimate build-out of the lots. Actual BMPs may vary and will be specified during the site plan review performed prior to the development of each lot, as mandated by the specific plan. Typical On-Lot LID BMPs are shown on Exhibit C-2.**

STEP 6

SOURCE CONTROL

Please complete the checklist on the following pages to determine Source Control BMPs. Below is instruction on how to use the checklist. (Also see instructions on page 60 of the *SUSMP)*

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies and list in Table 9.

2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your Source Control Exhibit in Attachment B.

3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs into Table 9.

4. Use the format in Table 9 below to summarize the project Source Control BMPs. Incorporate all identified Source Control BMPs in your Source Control Exhibit in Attachment B.

TABLE 9: PROJECT SOURCE CONTROL BMPS

Potential source of runoff pollutants	*Permanent source control BMPs*	*Operational source control BMPs*
Storm drain inlets in the public right-of-way.	Inlets will be stamped with, "No Dumping! Flows to Pacific Ocean", or similar.	Storm drain inlets within the public right-of-way will be maintained by the County of San Diego upon completion of the project. CASQA BMP Fact Sheet SC-44, "Drainage System Maintenance" is provided for reference in Attachment B.
Landscape/ Outdoor Pesticide Use (within the public right-of-way)	Landscaping will be designed to minimize irrigation and runoff. Hardy and pest-resistant plants will be utilized to reduce the need for fertilizers and pesticides. Landscaping in detention facilities will be designed with plants that are tolerant of saturated soil conditions. Plants will be selected to best suit the project's soils, climate, etc.	The project owner may be required to maintain landscaping within the public right-of-way for an interim period. Ultimately, a landscape maintenance district will be established to maintain the landscaping into perpetuity. CASQA BMP Fact Sheet SC-41, "Building and Grounds Maintenance" is provided for reference in Attachment B.

Proposed Source Control BMPs:
Otay Business Park proposes to construct public roads and rough graded pads. The public roads will have curb inlets collecting runoff from the streets. These inlets will all be stamped with, "No Dumping! Flows to Pacific Ocean", or similar. The project owner will initially be responsible for maintenance of the markings upon completion of the project. Ultimately, a maintenance district will be established to assume responsibility into perpetuity. Maintenance of landscaping and irrigation within the public right-of-way, including the regional detention basins, will initially be the responsibility of the project owner. Ultimately, a landscape maintenance district will be established to assume responsibility into perpetuity.

Additional source control BMPs anticipated at future on-lot developments are indicated on the following checklist with an " * ".

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 **Potential Sources of Runoff Pollutants – List in Table 9**	**2** **Permanent Controls—Show on Source Control Exhibit, Attachment B**	**3** **Permanent Controls—List in Table 9 and Narrative**	**4** **Operational BMPs—Include in Table 9 and Narrative**
■ **A.** On-site storm drain inlets *Applicable storm drain inlets are located in the public right-of-way. As such, maintenance of inlets will be assured by category 4 maintenance mechanisms.	■ Locations of inlets.	■ Mark all inlets with the words "No Dumping! Flows to Pacific Ocean" or similar where feasible.	■ Maintain and periodically repaint or replace inlet markings. ❑ Provide stormwater pollution prevention information to new site owners, lessees, or operators. ■ See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com ❑ Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains." (N/A AT THIS PHASE IN DEVELOPMENT)
■* **B.** Interior floor drains and elevator shaft sump pumps		■* State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	■* Inspect and maintain drains to prevent blockages and overflow.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 **Potential Sources of Runoff Pollutants – List in Table 9**	**2** **Permanent Controls—Show on Source Control Exhibit, Attachment B**	**3** **Permanent Controls—List in Table 9 and Narrative**	**4** **Operational BMPs—Include in Table 9 and Narrative**
❑ **C.** Interior parking garages		❑ State that parking garage floor drains will be plumbed to the sanitary sewer.	❑ Inspect and maintain drains to prevent blockages and overflow.
■* **D1.** Need for future indoor & structural pest control		■* Note building design features that discourage entry of pests.	■* Provide Integrated Pest Management information to owners, lessees, and operators.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 **Potential Sources of Runoff Pollutants – List in Table 9**	**2** **Permanent Controls—Show on Source Control Exhibit, Attachment B**	**3** **Permanent Controls—List in Table 9 and Narrative**	**4** **Operational BMPs—Include in Table 9 and Narrative**
■ **D2.** Landscape/ Outdoor Pesticide Use Note: Should be consistent with project landscape plan (if applicable).	❑ Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. ❑ Show self-retaining landscape areas, if any. (N/A – NONE PROPOSED AT THIS PHASE IN DEVELOPMENT) ■ Show stormwater treatment facilities.	State that final landscape plans will accomplish all of the following: ❑ Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. ■ Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. ■ Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. ■ Consider using pest-resistant plants, especially adjacent to hardscape. ■ To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	■ Maintain landscaping using minimum or no pesticides. ■ See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com ❑ Provide IPM information to new owners, lessees and operators.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 **Potential Sources of Runoff Pollutants – List in Table 9**	**2** **Permanent Controls—Show on Source Control Exhibit, Attachment B**	**3** **Permanent Controls—List in Table 9 and Narrative**	**4** **Operational BMPs—Include in Table 9 and Narrative**
❑ **E.** Pools, spas, ponds, decorative fountains, and other water features.	❑ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet.	❑ If the local municipality requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	❑ See applicable operational BMPs in Fact Sheet SC-72, "Fountain and Pool Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
❑ **F.** Food service	❑ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. ❑ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	❑ Describe the location and features of the designated cleaning area. ❑ Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	❑

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 **Potential Sources of Runoff Pollutants – List in Table 9**	**2** **Permanent Controls—Show on Source Control Exhibit, Attachment B**	**3** **Permanent Controls—List in Table 9 and Narrative**	**4** **Operational BMPs—Include in Table 9 and Narrative**
■* **G.** Refuse areas	❑ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. ❑ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. ❑ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	■* State how site refuse will be handled and provide supporting detail to what is shown on plans. ■* State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	■* State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
■* **H.** Industrial processes.	❑ Show process area.	■* If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."	■* See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 **Potential Sources of Runoff Pollutants – List in Table 9**	**2** **Permanent Controls—Show on Source Control Exhibit, Attachment B**	**3** **Permanent Controls—List in Table 9 and Narrative**	**4** **Operational BMPs—Include in Table 9 and Narrative**
■* **I.** Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	❑ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area. ❑ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. ❑ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	■* Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of local Hazardous Materials Programs for: ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release (CalARP) ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank	■* See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

■* **J.** Vehicle and Equipment Cleaning	❑ Show on drawings as appropriate: (1) Commercial/industrial facilities having vehicle /equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses. (2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use). (3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer. (4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.	■* If a car wash area is not provided, describe measures taken to discourage on-site car washing and explain how these will be enforced.	Describe operational measures to implement the following (if applicable): ■* Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. ❑ Car dealerships and similar may rinse cars with water only. ■* See Fact Sheet SC-21, "Vehicle and Equipment Cleaning," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

■* **K. Vehicle/Equipment Repair and Maintenance**	❑ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater. ❑ Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. ❑ Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.	■* State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. ■* State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. ■* State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	In the SUSMP report, note that all of the following restrictions apply to use the site: ■* No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. ■* No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately. ■* No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.

■* **L. Fuel Dispensing Areas**	❑ Fueling areas[1] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable. ❑ Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.		■* The property owner shall dry sweep the fueling area routinely. ■* See the Business Guide Sheet, "Automotive Service—Service Stations" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

[1] The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

■* **M.** Loading Docks	❑ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas should be drained to the sanitary sewer where feasible. Direct connections to storm drains from depressed loading docks are prohibited. ❑ Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. ❑ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		■* Move loaded and unloaded items indoors as soon as possible. ■* See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
■* **N.** Fire Sprinkler Test Water		■* Provide a means to drain fire sprinkler test water to the sanitary sewer.	■* See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

O. Miscellaneous Drain or Wash Water ■* Boiler drain lines ■* Condensate drain lines ■* Rooftop equipment ■* Drainage sumps ■* Roofing, gutters, and trim.		■* Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. ■* Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. ■* Rooftop mounted equipment with potential to produce pollutants shall be roofed and/or have secondary containment. ■* Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. ■* Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	
■* **P.** Plazas, sidewalks, and parking lots.			■* Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.

*Possible Source Control BMP; to be determined during the site plan review of each lot.

STEP 7

LID AND TREATMENT CONTROL SELECTION

Will this project be utilizing the unified LID design procedure as described in Chapter 4 of the Local SUSMP? *(If yes, please document in Attachment D following the steps in Chapter 4 of the County SUSMP)*	
Yes	No
If this project is not utilizing the unified LID design procedure, please describe how the alternative treatment facilities will comply with applicable LID criteria, stormwater treatment criteria, and hydromodification management criteria.	
Otay Business Park will construct rough graded pads and public roads. Runoff generated by the public roads will be tributary to extended detention basins sized for both treatment and hydromodification flow control, using the BMP Sizing Calculator; see Attachment H for additional detail. As an additional treatment measure, curb inlet filters will also be utilized.	

A treatment control BMP and/or LID IMP must be selected to treat the project pollutants of concern identified in Table 7 "Project Pollutants of Concern". A treatment control facility with a high or medium pollutant removal efficiency for the project's most significant pollutant of concern shall be selected. It is recommended to use the design procedure in Chapter 4 of the SUSMP to meet NPDES permit LID requirements, treatment requirements, and flow control requirements. If your project does not utilize this approach, the project will need to demonstrate compliance with LID, treatment and hydromodification flow control requirements. Review Chapter 2 "Selection of Stormwater Treatment Facilities" in the SUSMP to assist in determining the appropriate treatment facility for your project.

➢ Indicate the project pollutants of concern (POCs) from Table 7 in Column 2 below.

TABLE 10: GROUPING OF POTENTIAL POLLUTANTS of Concern (POCs) by fate during stormwater treatment

Pollutant	Check Project Specific POCs	Coarse Sediment and Trash	Pollutants that tend to associate with fine particles during treatment	Pollutants that tend to be dissolved following treatment
Sediment	X	X	X	
Nutrients	X		X	X
Heavy Metals	X		X	
Organic Compounds	X		X	
Trash & Debris	X	X		
Oxygen Demanding	X		X	
Bacteria	X		X	
Oil & Grease	X		X	
Pesticides	X		X	

➢ Indicate the treatment facility(s) chosen for this project in the following table.

TABLE 11: GROUPS OF POLLUTANTS and relative effectiveness of treatment facilities

Pollutants of Concern	Bioretention Facilities (LID)	Settling Basins (Dry Ponds)	Wet Ponds and Constructed Wetlands	Infiltration Devices (LID)	Media Filters	Higher-rate biofilters	Higher-rate media filters	Trash Racks & Hydro-dynamic Devices	Vegetated Swales
Coarse Sediment and Trash	High	High	High	High	High	High	High	High	High
Pollutants that tend to associate with fine particles during treatment	High	High	High	High	High	Medium	Medium	Low	Medium
Pollutants that tend to be dissolved following treatment	Medium	Low	Medium	High	Low	Low	Low	Low	Low

➢ Please check the box(s) that best describes the Treatment Control BMP(s) and/or LID IMP selected for this project. Please check if the treatment facility is designed for water quality or hydromodification flow control. Check both boxes if the facility is designed for both water quality and hydromodification flow control.

TABLE 12: PROJECT TCBMPS – BMPs designed to treat stormwater (e.g., LID and hydromod) shall be considered TCBMPs.

TCBMP Type	Water Quality Treatment	Hydromodification Flow Control
Bioretention Facilites (LID)		
☐ Bioretention area		
☐ Flow-through Planter		
☐ Cistern with Bioretention		
Basins		
■ Extended/dry detention basin with grass/vegetated lining	X	X
☐ Extended/dry detention basin with impervious lining		
☐ Underground vault		
☐ Cistern		

Infiltration Devices (LID)		
☐ Infiltration basin		
☐ Infiltration trench		
☐ Other_____		
Wet Ponds and Constructed Wetlands		
☐ Wet pond/basin (permanent pool)		
☐ Constructed wetland		
Vegetated Swales (LID[1])		
■ Vegetated Swale	X – where feasible	
Media Filters		
☐ Austin Sand Filter		
☐ Delaware Sand Filter		
☐ Multi-Chambered Treatment Train (MCTT)		
Higher-rate Biofilters		
☐ Tree-pit-style unit		
☐ Other_____		
Higher-rate Media Filters		
☐ Vault-based filtration unit with replaceable cartridges		
☐ Other_____		
Hydrodynamic Separator Systems		
☐ Swirl Concentrator		
☐ Other_____		
Trash Racks		
☐ Catch Basin Insert		
■ Catch Basin Insert w/ Hydrocarbon boom	X	
☐ Other_____		
Self-Retaining Areas (LID)		
☐ Permeable Pavements		
☐ Self-Retaining		
☐ Vegetated Roof		

[1] Must be designed per SUSMP "Vegetated Swales" design criteria for water quality treatment credit (p. 102-103).

For design guidelines and calculations refer to Chapter 4 "Low Impact Development Design Guide" in the SUSMP. Please show all calculations and design sheets for all treatment control BMPs proposed in Attachment D.

➢ Create a Construction Plan SWMP Checklist for your project.

Instructions on how to fill out table

1. Number and list each measure or BMP you have specified in your SWMP in Columns 1 and Maintenance Category in Column 3 of the table. Leave Column 2 blank.
2. When you submit construction plans, duplicate the table (by photocopy or electronically). Now fill in Column 2, identifying the plan sheets where the BMPs are shown. List all plan sheets on which the BMP appears. **This table must be shown on the front sheet of the grading and improvement plans.**

Treatment Control BMPs[1]			
Description / Type	Sheet	Maintenance Category	Revisions
INLET FILTER "F-1"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-2"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-3"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-4"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-5"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-6"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-7"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-8"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-9"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-10"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-11"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-12"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-13"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-14"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-15"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-16"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-17"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-18"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-19"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-20"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-21"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-22"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-23"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-24"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-25"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-26"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-27"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-28"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-29"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-30"		2 (Interim), 4 (Ultimate)	
INLET FILTER "F-31"		2 (Interim), 4 (Ultimate)	
DETENTION POND "A"		2 (Interim), 3 (Ultimate)	
DETENTION POND "B"		2 (Interim), 3 (Ultimate)	
[1]BMPs designed to treat stormwater (e.g., LID and hydromod) shall be considered TCBMPs.			

* BMP's approved as part of Stormwater Management Plan (SWMP) dated xx/xx/xx on file with DPW. Any changes to the above BMP's will require SWMP revision and Plan Change approvals.

- Please describe why the chosen treatment control BMP(s) was selected for this project. For projects utilizing a low performing BMP, please provide a **feasibility analysis** that demonstrates utilization of a treatment control BMP with a high or medium removal efficiency ranking is infeasible.

Onsite run-off will be collected through a storm drain pipe system that will flow into one of the two detention basins before discharging off-site to neighboring property as it does under existing conditions. Detention basins detain storm water runoff for a certain amount of time, which allows particles and associated pollutants to settle out of the water column. Detention basins have one of the highest removal efficiencies for the anticipated pollutants generated by the project and the pollutants identified on the 303(d) impaired water bodies list for Tijuana River. The removal effectiveness is low for nutrients only, medium for sediment, metals, bacteria, petroleum products (oil and grease), organics and high for trash.

Vegetated Swales will be utilized where feasible to capture roadway runoff from the public right-of-way via under sidewalk drains and will treat within the private landscape setbacks. The removal effectiveness of a vegetated swale is medium for the treatment of Sediment, Metals, Oil, Grease, and Organics. It is also anticipated to treat at a low level for Nutrients, Bacteria, Trash and Debris.

Catch basin inserts are designed to collect and contain sediment, debris and petroleum hydrocarbons (oil and grease) and bacteria. They perform as effective filtering devices at low flows but will not impede the system's maximum design flow. The removal effectiveness is medium for trash, petroleum hydrocarbons (oil and grease) and low efficiency for sediment, nutrients, metals, bacteria, and organics. BioClean Environmental inserts (or equivalent) are recommended for this project.

Additional permanent BMPs may be selected for individual lot development and shall be addressed in future SWMPs.

Please provide the sizing design calculations for each Drainage Management Area in Attachment D. Guidelines for design calculations are located in Chapter 4 of the County SUSMP. To assist in these calculations a BMP sizing calculator is available for use at the following location: http://www.projectcleanwater.org/html/wg_susmp.html

STEP 8

OPERATION AND MAINTENANCE

➢ Please check the box that best describes the maintenance mechanism(s) for this project. The recorded maintenance agreement shall be included in the Maintenance Plan for this project (Attachment F).

TABLE 13: PROJECT BMP CATEGORY

CATEGORY	SELECTED		BMP Description
	YES	NO	
First[1]	X		Vegetated Swales
Second[2]		X	
Third[3]	X		Detention Basins
Fourth[4]	X		Curb Inlet Filters

Note:

1. A maintenance notification will be required.
2. A recorded maintenance agreement and access easement will be required.
3. The project will be required to establish or be included in a watershed specific Community Facility District (CFD) for long-term maintenance.
4. The developer would be required to dedicate the BMP (and the property on which it is located and any necessary access) to the County.

TABLE 14: PROJECT SPECIFIC LID AND TC-BMPS

- Please list all individual Treatment Control BMPs (TCBMPs) incorporated into the project. Please attach the record plan sheets upon completion of project and amend the Major SWMP where appropriate. For each type of TCBMP provide an inspection sheet in Attachment F "Maintenance Plan". Replicate Table 14 in Attachment G once the TCBMP has been constructed.

Treatment Control BMPs (TCBMPs)[1,2] (List all from SWMP)		
BMP Identifier	Description/ Type	Sheet
INLET FILTER "F-1"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-2"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-3"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-4"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-5"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-6"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-7"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-8"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-9"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-10"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-11"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-12"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-13"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-14"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-15"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-16"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-17"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-18"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-19"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-20"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-21"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-22"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-23"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-24"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-25"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-26"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-27"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-28"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-29"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-30"	TC-BMP	4 (Location), 2 (Detail)
INLET FILTER "F-31"	TC-BMP	4 (Location), 2 (Detail)
DETENTION POND "A"	TC-BMP	4 (Location), 24 (Detail)
DETENTION POND "B"	TC-BMP	4 (Location), 24 (Detail)

[1] All Priority Development Projects (PDPs) require a TCBMP

[2] BMPs designed to treat Stormwater (e.g., LID and hydromod) shall be considered TCBMPs.

* For location of BMP's, see approved Record Plan dated XX/XX/XX , plan (TYPE) sheet (#)

➢ Responsible Party for the Construction Phase:

Identify the parties responsible for maintenance during the construction phase of the BMPs identified above and Source Controls specified in Attachment B.

Developer's Name: **Otay Business Park, LLC**		
Address: **4370 La Jolla Village Drive, Suite 640**		
City: **San Diego**	State: **CA**	Zip: **92122**
Email Address: **Ricardo@Paragoncompany.com, Ricardo Jinich**		
Phone Number: **(858) 535-9047**		
Engineer of Work: **Mark Stevens, Stevens Cresto Engineering, Inc**		
Engineer's Phone Number: **(858) 694-5660**		

➢ Responsible Party for Ongoing Maintenance:

Identify the parties responsible for long-term maintenance of the BMPs identified above and Source Controls specified in Attachment B. Include the appropriate written agreement with the entities responsible for O&M in Attachment F. Please see Chapter 5 "Stormwater Facility Maintenance" of the County SUSMP for appropriate maintenance mechanisms.

Owner's Name: **Otay Business Park, LLC**		
Address: **4370 La Jolla Village Drive, Suite 640**		
City: **San Diego**	State: **CA**	Zip: **92122**
Email Address: **Ricardo@Paragoncompany.com, Ricardo Jinich**		
Phone Number: **(858) 535-9047**		
*Note: If a corporation or LLC, provide information for principal partner or Agent for Service of Process. If an HOA, provide information for the Board or property manager at time of project closeout.		

NOTE: The detention basins listed in Table 14 will be maintained by a Maintenance Assessment District and the Bio-Clean filter inserts will be public responsibility. The project owner will be responsible for maintenance of the facilities for an interim period.

➢ Funding Source:

Provide the funding source or sources for long-term operation and maintenance of each BMP identified above. Please see Chapter 5 "Stormwater Facility Maintenance" of the County SUSMP for the appropriate funding source options. By certifying the Major SWMP the applicant is certifying that the funding responsibilities have been addressed and will be transferred to future owners.

FISCAL RESOURCES

SECOND CATEGORY - Maintenance Requirement for Private On-Lot Systems:
As required by the San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance No. 10096 SEC 67.813, the proposed project Post-Construction BMPs, per the County Maintenance Plan Guidelines, fall under the second category of maintenance assurance requirements. A Stormwater Facilities Maintenance Agreement, with Easement and Covenants shall be entered into between the owner and the County of San Diego, obliging the owner to maintain the project category two BMPs into perpetuity. An adaptation of the County Maintenance Plan Guidelines follows and details the proposed Maintenance Mechanism and funding.

BMPs covered:

- Curb Inlet Filter (Bio-Clean) – Interim 2nd Category Maintenance
- Regional Detention Basins (DB) – Interim 2nd Category Maintenance

A. Mechanisms to Assure Maintenance:

1. Stormwater Ordinance (SO) Requirement:
The County of San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance (SO) requires this ongoing maintenance. In the event that the mechanisms below prove ineffective, or in addition to enforcing those mechanisms, civil action, criminal action or administrative citation could also be pursued for violations of the ordinance.

2. Public Nuisance Abatement:
Under the SO, failure to maintain BMPs would constitute a public nuisance, which may be abated under the Uniform Public Nuisance Abatement Procedure. This provides an enforcement mechanism in addition to the above, and would allow costs of maintenance to be billed to the owner, a lien placed on the property, and the tax collection process to be used.

3. Notice to Purchasers:
Section 67.819(e) of the SO requires developers to provide clear written notification to persons acquiring land upon which a BMP is located, or others assuming a BMP maintenance obligation, of the maintenance duty.

4. Conditions in Ongoing Land Use Permits:
For those applications (listed in SO Section 67.804) upon whose approval ongoing conditions may be imposed, a condition will be added which requires the owner of the

land upon which the stormwater facility is located to maintain that facility in accordance with the requirements specified in the Stormwater Maintenance Plan. Failure to perform maintenance may then be addressed as a violation of the permit, under the ordinance governing that permit process.

5. Subdivision Public Report:
Tentative Map and Tentative Parcel Map approvals will be conditioned to require that, prior to approval of a Final or Parcel Map, the subdivider shall provide evidence to the Director of Public Works, that the subdivider has requested the California Department of Real Estate to include in the public report to be issued for the sales of lots within the subdivision, a notification regarding the maintenance requirement. (The requirement for this condition would not be applicable to subdivisions which are exempt from regulation under the Subdivided Lands Act, or for which no public report will be issued.)

6. BMP Maintenance Agreement with Easement and Covenant:
An agreement will be entered into with the County, which will function three ways:

(a) it will commit the land to being used only for purposes of the BMP;

(b) it will include an agreement by the landowner, to maintain the facilities in accordance with the SMP (this obligation would be passed on to future purchasers or successors of the landowner, as a covenant); and

(c) it will include an easement giving the County the right to enter onto the land (and any necessary adjacent land needed for access) to maintain the BMPs.

This would be required of all applications listed in SO Section 67.804. In the case of subdivisions, this easement and covenant would be recorded on or prior to the Final or Parcel Map.

Funding:
Developer will provide the County with SECURITY to back up the maintenance agreement, which shall remain in place for an interim period of 5 years. The amount of the security shall equal the estimated cost of 2 years of maintenance activities. The security can be a Cash Deposit, Letter of Credit or other form acceptable to the County.

THIRD CATEGORY - Maintenance Requirement for Regional Facilities:

As required by the San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance No. 10096 SEC 67.813, the proposed regional detention basins that service the public streets, per the County Maintenance Plan Guidelines, fall under the third category of maintenance assurance requirements. A Storm Water Maintenance Zone shall be established to ensure proper maintenance of the proposed BMPs into perpetuity. Initiation of the process to create the zone will occur during the Final Engineering stage of the project. At that time, a County appointed consultant will prepare the documentation necessary to establish the zone. The Civil Engineer working on the project will assist the consultant and the County Department of Public Works as necessary through the process. An adaptation of the County Maintenance Plan Guidelines follows and details the proposed maintenance mechanism and funding.

BMPs covered:

- Regional Detention Basins (DB)

A. Mechanisms to Assure Maintenance:

1. Dedication of BMP to County:
The developer would be required to dedicate the BMP (and the property on which it is located) to the County. This could be an immediate dedication, or for cases where the County would not want to assume responsibility for the facility for some time (e.g., until after construction is completed), then an IOD could be used instead.

2. County Maintenance Documentation:
Where the County has assumed maintenance responsibility, internal County program documentation would memorialize the required maintenance.

Funding:
The primary funding mechanism will be a special assessment under the authority of the Flood Control District. The assessment will be collected with property tax. Because this primary funding mechanism will require substantial amount of time to establish and collect assessments, a developer fee will be needed to cover the initial maintenance period of 24 months.

FOURTH CATEGORY - Maintenance Requirement for Public Streets:

As required by the San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance No. 10096 SEC 67.813, and the County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvements (March 2008), the proposed project Post-Construction BMPs for public streets, per the County Maintenance Plan Guidelines, fall under the fourth category of maintenance assurance requirements. An adaptation of the County Maintenance Plan Guidelines follows and details the proposed maintenance mechanism and funding.

BMPs covered:

- Curb Inlet Filter (Bio-Clean)

A. Mechanisms to Assure Maintenance:

1. Dedication of BMP to County:
The developer would be required to dedicate the BMP (and the property on which it is located) to the County. This could be an immediate dedication, or for cases where the County would not want to assume responsibility for the facility for some time (e.g., until after construction is completed), then an IOD could be used instead.

2. County Maintenance Documentation:
Where the County has assumed maintenance responsibility, internal County program documentation would memorialize the required maintenance.

Funding:
A permanent source will be implemented; options include gas tax, TransNet, General Fund, or new special taxes or fees.

ATTACHMENTS

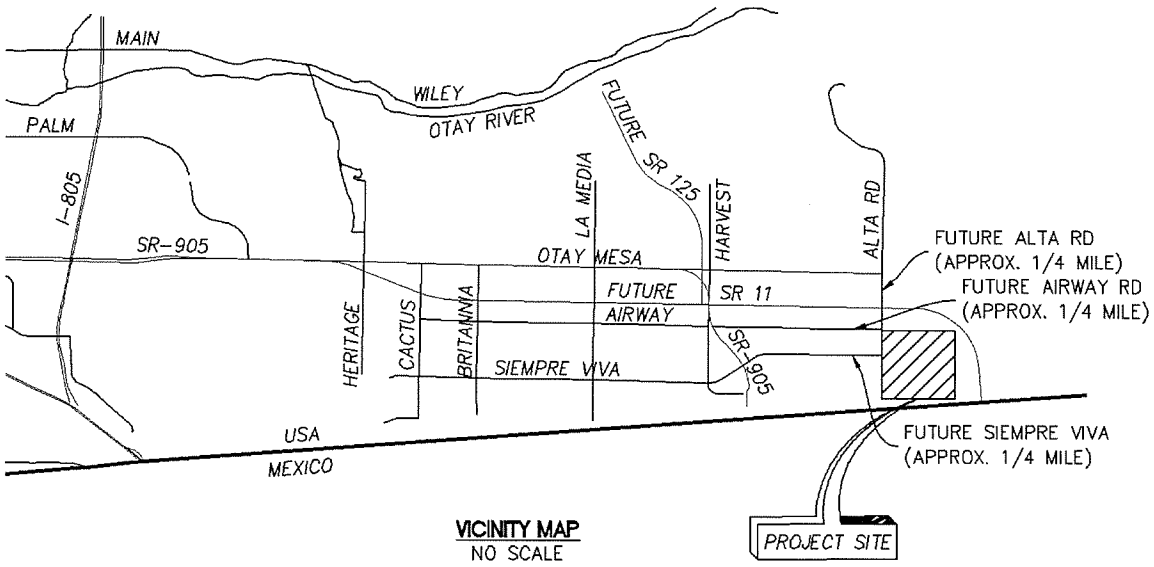
Please include the following attachments.

ATTACHMENT		COMPLETED	N/A
A	Project Location Map	X	
B	Source Control Exhibit	X	
C	Drainage Management Area (DMA)Exhibit	X	
D	BMP Sizing Design Calculations (Water Quality) and TCBMP/IMP Design Details	X	
E	Geotechnical Certification Sheet		X
F	Maintenance Plan	X	
G	Treatment Control BMP Certification (due at project completion)		X
H	HMP Study	X	
I	Geomorphic Assessment (Approved)	X	
J	HMP Exemption Documentation		X
K	Addendum		X

Note: Attachments B and C may be combined.

ATTACHMENT A

Project Location Map

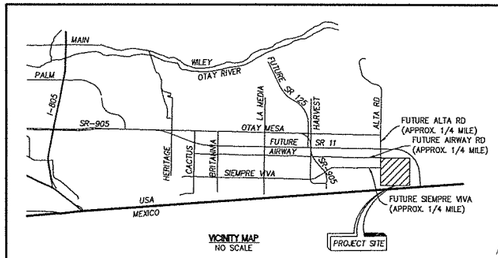


VICINITY MAP
NO SCALE

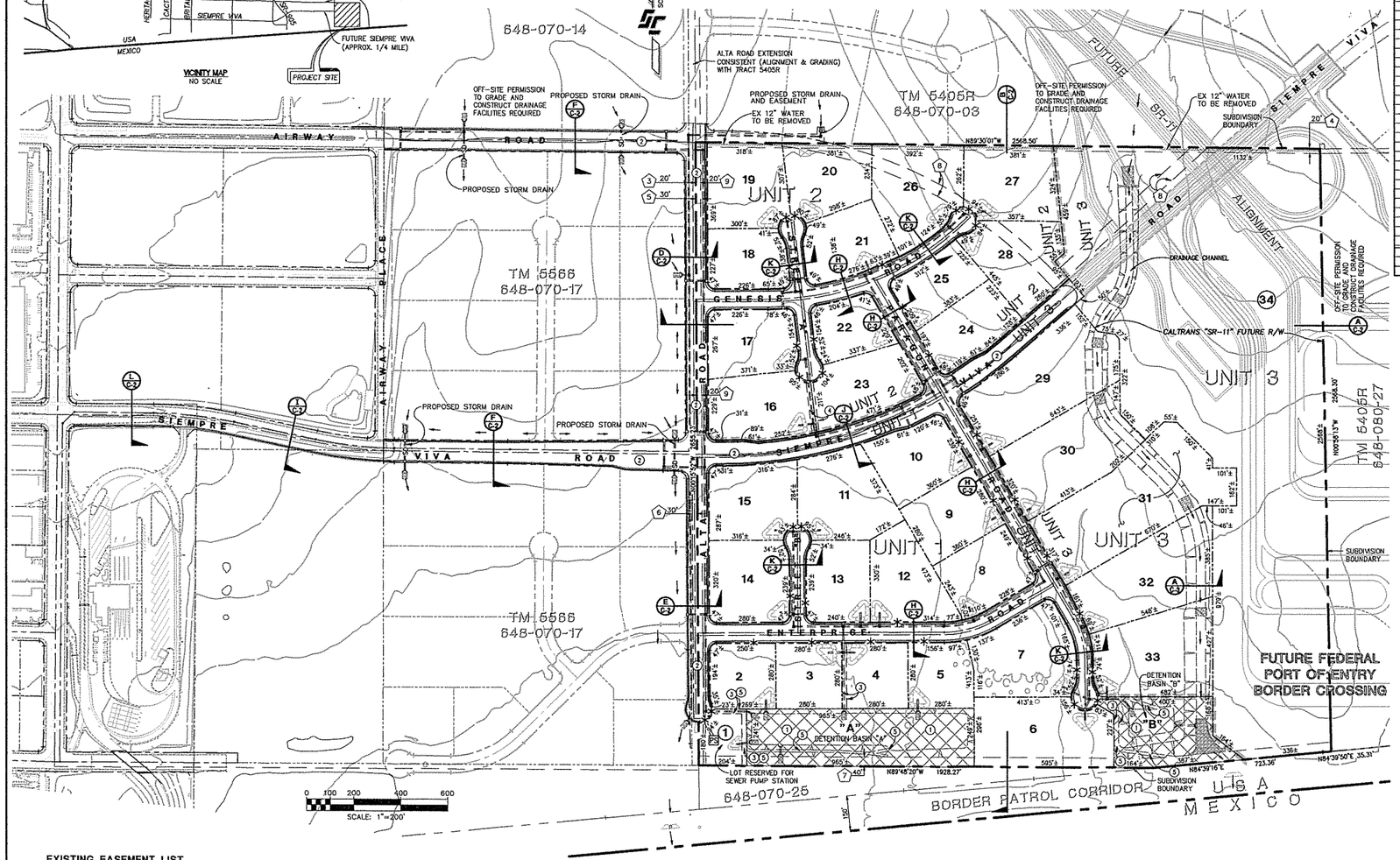
Vicinity Map

No Scale

COUNTY OF SAN DIEGO TRACT 5505R
VESTING TENTATIVE MAP
OTAY BUSINESS PARK



VICINITY MAP
NO SCALE



LOT AREAS	
NO.	ACREAGE
1	1.06 (SEWER PUMP STATION)
2	1.79
3	1.80
4	1.80
5	1.77
6	3.87
7	3.34
8	2.29
9	2.31
10	2.39
11	3.14
12	2.61
13	2.14
14	2.70
15	2.73
16	2.75
17	2.39
18	1.96
19	2.79
20	2.43
21	2.25
22	1.72
23	2.59
24	2.14
25	1.86
26	3.36
27	2.88
28	2.84
29	5.01
30	4.29
31	6.39
32	4.35
33	4.06
34	43.12 (FUT. CALTRANS R/W)
"A"	5.43 (DETENTION BASIN LOT)
"B"	3.09 (DETENTION BASIN LOT)
TOTAL LOT AREA	143.4± AC.
ON-SITE ROAD AREA	18.2± AC.
TOTAL PROJECT AREA	161.6± AC.

LEGEND

DESCRIPTION	SYMBOL
PROPOSED LOT NUMBER	(1)
SUBDIVISION BOUNDARY	
INTERNATIONAL BORDER	
EXISTING CONTOUR	330
PROPOSED LOT LINE	
PROPOSED RIGHT-OF-WAY	
PROPOSED RIGHT-OF-WAY SR-11	
EXISTING EASEMENT	
FUTURE RIGHT-OF-WAY	
EXISTING WATER LINE	W
PROPOSED SEWER LINE	S
PROPOSED WATER LINE	W
PROPOSED STORM DRAIN	SD
PROPOSED EASEMENT	
PROPOSED WING-TYPE HEADWALL	
PROPOSED CATCH BASIN	
RIP RAP	
PROPOSED FORCE MAIN	SFM
PROPOSED PUMP STATION	PS
SLOPE RATIO	2:1 MAX FILL, 1.5:1 MAX CUT
PROPOSED CONTOUR	500
DAYLIGHT LINE	
FLOWAGE	
DRIVEWAY LOCATION (APPROXIMATE – SEE GENERAL NOTE 23 BELOW)	*

AREA TABLE

GROSS ACREAGE WITHIN SUBDIVISION BOUNDARY:	161.6± ACRES
PROPOSED FUTURE CALTRANS RIGHT-OF-WAY (LOT 34):	43.1± ACRES
PROPOSED ON-SITE PUBLIC ROADWAYS (EXCLUDING FUTURE CALTRANS R/W):	18.2± ACRES
PROPOSED ON-SITE DETENTION BASINS (LOTS "A" & "B"):	8.5± ACRES
PROPOSED ON-SITE SEWER PUMP STATION FACILITY (LOT 1):	1.1± ACRES
TOTAL DEVELOPABLE LOT AREA (EXCLUDES LOTS "A", "B", 1 AND 34):	90.7± ACRES

GENERAL NOTES

1. AREA BREAKDOWN (SEE AREA TABLE ABOVE)
2. TOTAL NUMBER OF LOTS: 36 (32 COMMERCIAL/INDUSTRIAL LOTS, 2 ON-SITE DETENTION BASINS (LOTS "A" & "B"), 1 LOT (LOT 34) RESERVED FOR FUTURE SR-11 RIGHT-OF-WAY AND 1 LOT (LOT 1) RESERVED FOR SEWER PUMP STATION FACILITY). MINIMUM INDUSTRIAL LOT SIZE: 1.72± ACRES.
3. EXISTING ZONING – S-88
4. PROPOSED ZONING – S-88
5. GENERAL PLAN REGIONAL CATEGORY: VILLAGE
6. GENERAL PLAN LAND USE DESIGNATION: SPECIFIC PLAN AREA
7. COMMUNITY PLAN OR SUBREGIONAL PLAN: OTAY MESA SUBREGIONAL PLAN, EAST OTAY MESA SPECIFIC PLAN
8. SPECIAL ASSESSMENT ACT PROCEEDINGS – MAY BE REQUESTED FOR THIS PROJECT.
9. PARK LAND DEDICATION NOT REQUIRED IN AN INDUSTRIAL ZONE.
10. STREET LIGHTS WILL BE INSTALLED TO COMPLY WITH THE REQUIREMENTS SPECIFIED BY THE COUNTY STANDARDS.
11. ALL LOTS WITHIN THIS SUBDIVISION HAVE A MINIMUM OF 100 SQUARE FEET OF SOLAR ACCESS FOR EACH FUTURE DWELLING/COMMERCIAL/INDUSTRIAL UNIT ALLOWED BY THIS SUBDIVISION.
12. SOURCE OF TOPOGRAPHY: PHOTOGRAMMETRY PREPARED BY PHOTO GEODETIC CORPORATION. DATE OF PHOTOGRAPHY: OCTOBER 15, 2009
13. DISTRICTS / UTILITY SERVICE PROVIDERS:
    SEWER – SAN DIEGO COUNTY SANITATION DISTRICT
    WATER – OTAY WATER DISTRICT
    GAS & ELECTRIC – SDG&E
    TELEPHONE – AT&T
    FIRE – SAN DIEGO RURAL FIRE PROTECTION DISTRICT
    STREET LIGHTING – COUNTY OF SAN DIEGO
14. ALL PROPOSED UTILITIES TO BE UNDERGROUND EXCEPT WATER TREATMENT SWALES.
15. ALL ON-SITE STREETS WILL BE PUBLIC.
16. IMPROVEMENTS, EASEMENTS AND DEDICATIONS WILL COMPLY WITH THE REQUIREMENTS SPECIFIED IN THE COUNTY STANDARDS.
17. ALL EXISTING EASEMENTS NOT REMAINING IN USE SHALL BE VACATED PRIOR TO RECORDATION OF THE FINAL MAP(S) SUBJECT TO THE SATISFACTION THE DIRECTOR OF PUBLIC WORKS.
18. STORM WATER DETENTION SHALL BE PROVIDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE EAST OTAY MESA SPECIFIC PLAN. THIS DETENTION WILL BE ACCOMPLISHED THROUGH UTILIZATION OF 2 DETENTION BASINS TO SERVE THE OVERALL PROJECT.
19. LAMBERT COORDINATES: 138–1785
20. THIS PLAN IS PROVIDED TO ALLOW FOR FULL AND ADEQUATE DISCRETIONARY REVIEW OF A PROPOSED DEVELOPMENT PROJECT. THE PROPERTY OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE AN APPROVAL TO PERFORM ANY GRADING SHOWN HEREON, AND AGREES TO OBTAIN VALID GRADING PERMISSIONS BEFORE COMMENCING SUCH ACTIVITY.
21. THIS PROJECT IS A MULTI-UNIT SUBDIVISION. MULTIPLE FINAL MAPS MAY BE FILED PURSUANT TO SECTION 66456.1 OF THE SUBDIVISION MAP ACT
22. PRIOR TO THE APPROVAL OF ANY SITE PLAN FOR ANY DEVELOPMENT PROPOSAL WITHIN THE NOISE PROTECTION EASEMENT, THE APPLICANT SHALL:

    W-N-2. THE PERMIT COMPLIANCE ENGINEER SHALL ENSURE THAT ON-SITE GRADING OPERATIONS DO NOT OCCUR WITHIN 225 FEET OF ANY PROPERTY LINE THAT ABUTS PROPERTIES WHERE ACTIVE GRADING ACTIVITIES ARE OCCURRING. ON-SITE GRADING ACTIVITIES ADJACENT TO THE PROPERTY LINE MAY OCCUR IF GRADING ACTIVITIES FOR ADJACENT PROPERTIES ARE OCCURRING AT A MINIMUM DISTANCE OF 225 FEET FROM THE SHARED PROPERTY LINE. THE PERMIT COMPLIANCE ENGINEER (AS DEFINED IN SECTION 87.420 OF THE COUNTY GRADING ORDINANCE) SHALL DEMONSTRATE COMPLIANCE WITH THIS REQUIREMENT IN THE REGULAR REPORTS REQUIRED PURSUANT TO SECTION 87.420(A) OF THE COUNTY'S GRADING ORDINANCE. THE REGULAR REPORTS SHALL IDENTIFY ANY DAYS WHERE GRADING ACTIVITIES WERE RESTRICTED ON-SITE OR ON ADJACENT PROPERTIES IN ORDER TO ENSURE A MINIMUM DISTANCE OF 225 FEET BETWEEN GRADING ACTIVITIES.
23. PROPOSED DRIVEWAY LOCATIONS SHOWN HEREON ARE APPROXIMATE. PRIVATE DRIVEWAY LOCATIONS MAY VARY FROM THE LOCATIONS SHOWN HEREON DEPENDANT UPON THE NEEDS OF FUTURE DEVELOPMENT OF INDIVIDUAL LOTS AND ARE SUBJECT TO A SITE DEVELOPMENT PLAN REVIEW AND APPROVAL.

EXISTING EASEMENT LIST

SEE FIRST AMENDED PRELIMINARY REPORT (P.R.) BY CHICAGO TITLE COMPANY, ORDER NO. 122007050-U50, DATED JANUARY 27, 2014. ITEMS LISTED BELOW ARE SHOWN IN THE P.R. AND AFFECT THE SUBJECT PROPERTY. ASSESSOR'S PARCEL NO. 648-070-21. PLOTTABLE ITEMS ARE DENOTED THUS: (n) WITH LOCATIONS KEYED THE SAME HEREON.

(3) 20' WIDE EASEMENT TO OTAY MUNICIPAL WATER DISTRICT FOR PIPELINES. RECORDED JUNE 5, 1968 AS FILE NO. 93912, OF OFFICIAL RECORDS.

(4) 20' WIDE EASEMENT TO OTAY MUNICIPAL WATER DISTRICT FOR PIPELINES. RECORDED JANUARY 6, 1970 AS FILE NO. 2033, OF OFFICIAL RECORDS.

(5) 30' WIDE EASEMENT TO OTAY MUNICIPAL WATER DISTRICT FOR PIPELINES. RECORDED FEBRUARY 26, 1974 AS FILE NO. 74-051081, OF OFFICIAL RECORDS.

(6) 30' WIDE EASEMENT IN BENEFIT OF SUBJECT PROPERTY (SEE LEGAL DESCRIPTION, PARCEL 2) FOR INRESS/EGRESS, PIPLINES, DRAINAGE AND/OR PUBLIC UTILITES AND INCIDENTAL PURPOSES THERETO OVER, UNDER, ALONG AND ACROSS THE EASEMENT PARCEL(S) THEREIN DESCRIBED, AS GRANTED AND/OR RESERVED IN VARIOUS DEEDS OF RECORD.

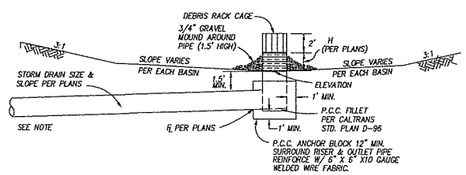
(7) 40' WIDE EASEMENT TO SAN DIEGO GAS & ELECTRIC FOR PUBLIC UTILITIES. RECORDED MARCH 24, 1999, AS FILE NO. 1999-0161043, OF OFFICIAL RECORDS.

(8) IRREVOCABLE OFFER TO DEDICATE LAND FOR PUBLIC HIGHWAY TO COUNTY OF SAN DIEGO. RECORDED SEPTEMBER 22, 2011 AS FILE NO. 2011-0492241, OF OFFICIAL RECORDS.

(9) IRREVOCABLE OFFER TO DEDICATE LAND FOR SEWER PURPOSES TO COUNTY OF SAN DIEGO. RECORDED SEPTEMBER 22, 2011 AS FILE NO. 2011-0492242, OF OFFICIAL RECORDS.

EASEMENT NOTES

1. WITH THE APPROVAL OF THE FINAL MAP(S), FOR THE DRAINAGE TO MEXICO, EASEMENTS SHALL BE DEDICATED TO THE COUNTY OF SAN DIEGO OVER DETENTION BASINS, APPURTENANT STRUCTURES AND ACCESS ROUTES (SAID ROUTES NECESSARY TO MAINTAIN THE FOREGOING) TO A COUNTY MAINTAINED ROAD. THIS REQUIRES HYDROLOGIC AND HYDRAULIC REPORTS TO ENSURE APPROPRIATE PRIVATE STORMWATER DETENTION FACILITIES SUCH THAT PEAK STORMWATER FLOWS FROM THE ENTIRE SITE REMAIN THE SAME AS BEFORE THE PROJECT WAS DEVELOPED. ALL OF THE FOREGOING SHALL BE TO THE SATISFACTION OF THE DIRECTOR OF PUBLIC WORKS.
2. ANY DESIGNATED BIOLOGICAL OPEN SPACE SHALL COMPLY WITH COVENANTS AND RESTRICTIONS IDENTIFIED IN THE OTAY BUSINESS PARK E.I.R. AND BIOLOGICAL REPORT.
3. LIMITED BUILDING ZONE. ALL LOTS AFFECTED SHALL COMPLY WITH BUILDING RESTRICTIONS AS IDENTIFIED IN THE OTAY BUSINESS BUSINESS PARK ENVIRONMENTAL IMPACT REPORT AND FIRE PROTECTION PLAN.



NOTE: TRENCH BACKFILL SHALL CONSIST OF NATIVE MATERIALS, APPROVED BY THE SOILS ENGINEER PRIOR TO PLACEMENT. OPEN-GRADED, HIGHLY PERMEABLE MATERIAL SHALL NOT BE USED AS BACKFILL.

CMP RISER, HOT-DIPPED GALVANIZED 12-GAUGE, 2-2/3 INCH X 1/2 INCH CORRUGATIONS. DIAMETER PER PLANS. CUT FIVE HORIZONTAL SLOTS OF 1/4 INCH X 10 INCHES (EQUALLY SPACED AROUND CIRCUMFERENCE). FIRST ROW TO BE 4 INCHES BELOW UNIVERSAL BAND COUPLER. SECOND ROW TO BE STAGGERED AT 5-1/3 INCHES BELOW FIRST ROW. CONTINUE STAGGERED ROWS UNTIL 24 INCHES ABOVE SOFFET OF PRIVATE STORM DRAIN PIPE.

MAINTENANCE

SEDIMENT SHALL BE REMOVED WHENEVER STORAGE CAPACITY (AT DEPTH 'H') HAS BEEN ACHIEVED. SEDIMENT SHALL BE DISPOSED OF IN SUCH A MANNER THAT WILL PREVENT ITS RETURN TO THE DESILTING BASIN OR MOVEMENT INTO DOWNSTREAM AREAS DURING SUBSEQUENT RUNOFF. THE DESILTING BASINS ARE PRIVATE FACILITIES, AND THE COUNTY WILL NOT BE RESPONSIBLE FOR THEIR MAINTENANCE.

PVT. TEMPORARY EROSION CONTROL DESILTING BASIN
NO SCALE

KEY NOTES

(1) PROPOSED DRAINAGE DETENTION BASIN (HYDROMODIFICATION BMP)
(2) SEE PRELIMINARY ROUTE STUDIES FOR ROADWAY ELEVATION ON CIRCULATION ELEMENT ROADWAYS.
(3) PROPOSED 20' WIDE ACCESS AND UTILITY EASEMENT.
(4) PROPOSED 30' WIDE ACCESS AND UTILITY EASEMENT.
(5) DRAINAGE DETENTION BASIN MAINTENANCE ACCESS ROAD PER COUNTY OF SAN DIEGO STANDARDS.

GRADING QUANTITIES

GRADED AREA:	161.6±± ACRES
CUT QUANTITIES:	1,135,000 CYD
FILL QUANTITIES:	1,135,000 CYD
IMPORT/EXPORT:	0 CYD

ASSESSOR'S PARCEL NUMBER
648-070-21

TAX RATE AREA
84035

NOTE: GRADING QUANTITIES ARE ESTIMATED FOR PERMIT PURPOSES ONLY AND ARE NOT INTENDED TO BE USED AS FINAL PAY QUANTITIES.

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE NAD 83, ZONE 6 GRID BEARING BETWEEN CITY OF SAN DIEGO CONTROL MONUMENTS 1494 AND 1496 AS SHOWN ON RECORD OF SURVEY 14492 BEARING: NORTH 44°35'23" WEST

LEGAL DESCRIPTION

PARCEL 1:

THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 18 SOUTH, RANGE 1 EAST, SAN BERNARDINO BASE AND MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF.

EXCEPTING THEREFROM THAT PORTION CONVEYED TO UNITED STATES OF AMERICA, IMMIGRATION AND NATURALIZATION SERVICE BY DEED RECORDED APRIL 7, 2000, AS FILE NO. 2000-0177412, OFFICIAL RECORDS.

PARCEL 2:

AN EASEMENT FOR INGRESS AND EGRESS OVER THE EASTERLY 30 FEET OF THE WEST ONE-HALF OF SECTION 31, TOWNSHIP 18 SOUTH, RANGE 1 EAST, SAN BERNARDINO BASE AND MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF.

SHEET INDEX

EXISTING SLOPE ANALYSIS TABLE

0–15% SLOPES	158.83± AC.
15–25% SLOPES	1.32± AC.
25–50% SLOPES	1.27± AC.
50% OR GREATER SLOPES	0.18± AC.
TOTAL	161.60± AC.

ZONING APN 648-070-21

ZONE	
USE REGULATIONS	S88
ANIMAL REGULATIONS	–
DEVELOPMENT REGULATIONS: DENSITY	–
DEVELOPMENT REGULATIONS: LOT SIZE	30,000
DEVELOPMENT REGULATIONS: BUILDING TYPE	W
DEVELOPMENT REGULATIONS: MAX. FLOOR AREA	–
DEVELOPMENT REGULATIONS: FLOOR AREA RATIO	0.40
DEVELOPMENT REGULATIONS: HEIGHT	R
DEVELOPMENT REGULATIONS: LOT COVERAGE	0.40
DEVELOPMENT REGULATIONS: SETBACK	V
DEVELOPMENT REGULATIONS: OPEN SPACE	–
SPECIAL AREA REGULATIONS	B & POR. G

OWNER/SUBDIVIDER

OTAY BUSINESS PARK
4370 LA JOLLA VILLAGE DRIVE, SUITE 640
SAN DIEGO, CA 92122
PHONE: 858-535-9047
FAX: 858-535-9100

BY: _____
RICARDO JINICH DATE:

ENGINEER OF WORK

MARK E. STEVENS DATE
R.C.E. 35502

REGISTERED PROFESSIONAL ENGINEER MARK E. STEVENS No. 35502 Exp. 9-30-15 CIVIL STATE OF CALIFORNIA

REVISIONS	BY

STEVENS · CRESTO ENGINEERING, INC.
CIVIL ENGINEERS · PLANNERS · LAND SURVEYORS
9665 CHESAPEAKE DRIVE, SUITE 200, SAN DIEGO, CA 92123-1352
PHONE: 858.694.5540
FAX: 858.694.5641
www.scengr.com

REGISTERED PROFESSIONAL ENGINEER MARK E. STEVENS No. 35502 Exp. 9-30-15 CIVIL STATE OF CALIFORNIA

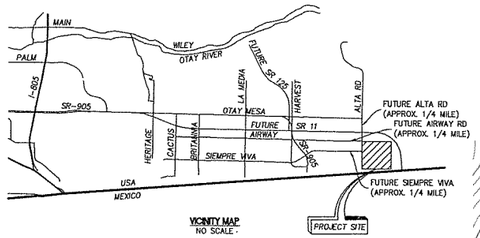
VESTING TENTATIVE MAP

SAN DIEGO
OTAY BUSINESS PARK
COUNTY OF SAN DIEGO, CALIFORNIA

Date:	FEBRUARY 2014
Scale:	AS SHOWN
Drawn:	SCE
Job:	12009.02
Sheet	C-1
	1 of 10 Sheets

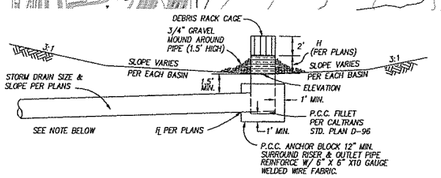
X:\2012\12009\CAD\PRELIM\TM\12009 C-01 TM.dwg 4/15/2014 2:46:32 PM PDT

COUNTY OF SAN DIEGO TRACT 5505R
PRELIMINARY GRADING PLAN
OTAY BUSINESS PARK



VICINITY MAP
NO SCALE

SCALE: 1"=200'

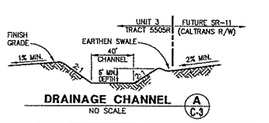


NOTE: TRENCH BACKFILL SHALL CONSIST OF NATIVE MATERIALS, APPROVED BY THE SOILS ENGINEER PRIOR TO PLACEMENT. OPEN-GRADED, HIGHLY PERMEABLE MATERIAL SHALL NOT BE USED AS BACKFILL.

CMP RISER, HOT-DIPPED GALVANIZED 12-GAUGE, 2-2/3 INCH X 1/2 INCH CORRUGATIONS. DIAMETER PER PLANS. CUT FIVE HORIZONTAL SLOTS OF 1/4 INCH X 10 INCHES (EQUALLY SPACED AROUND CIRCUMFERENCE). FIRST ROW TO BE 4 INCHES BELOW UNIVERSAL BAND COUPLER. SECOND ROW TO BE STAGGERED AT 5-1/3 INCHES BELOW FIRST ROW. CONTINUE STAGGERED ROWS UNTIL 24 INCHES ABOVE SOFTET OF PRIVATE STORM DRAIN PIPE.

MAINTENANCE
SEDIMENT SHALL BE REMOVED WHENEVER STORAGE CAPACITY (AT DEPTH 'H') HAS BEEN ACHIEVED. SEDIMENT SHALL BE DISPOSED OF IN SUCH A MANNER THAT WILL PREVENT ITS RETURN TO THE DESILTING BASIN OR MOVEMENT INTO DOWNSTREAM AREAS DURING SUBSEQUENT RUNOFF. THE DESILTING BASINS ARE PRIVATE FACILITIES, AND THE COUNTY WILL NOT BE RESPONSIBLE FOR THEIR MAINTENANCE.

PVT. TEMPORARY EROSION CONTROL DESILTING BASIN
NO SCALE



DRAINAGE CHANNEL (A C-3)
NO SCALE

ADVISORY NOTE ON STORMWATER OBLIGATIONS:
1. THE ACTIVITIES SHOWN ON THE PLANS ARE SUBJECT TO ENFORCEMENT UNDER PERMITS FROM THE SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD AND MUST ALSO COMPLY WITH THE REQUIREMENTS OF THE SAN DIEGO COUNTY MUNICIPAL STORM WATER PERMIT. THIS INCLUDES REQUIREMENTS FOR MATERIALS AND WASTES CONTROL, EROSION CONTROL, AND SEDIMENT CONTROL ON PROJECT CONSTRUCTION SITES. THE PERMITTEES OF OPERATIONS SHOWN ON THESE PLANS ARE OBLIGATED TO INSURE COMPLIANCE WITH ALL APPLICABLE STORM WATER REGULATIONS AT ALL TIMES. THE PERMITTEE SHALL ALSO KEEP A COPY OF THE SWPPP (STORM WATER POLLUTION PREVENTION PLAN) ON SITE AND AVAILABLE FOR REVIEW BY COUNTY.
2. DURING THE RAINY SEASON THE AMOUNT OF EXPOSED SOIL ALLOWED AT ONE TIME SHALL NOT EXCEED THAT WHICH CAN BE ADEQUATELY PROTECTED BY THE PROPERTY OWNER OR AUTHORIZED AGENT IN THE EVENT OF A RAINSTORM, 125% OF ALL SUPPLIES NEEDED FOR BMP MEASURES SHALL BE RETAINED ON THE JOB SITE IN A MANNER THAT ALLOWS FULL DEPLOYMENT AND COMPLETE INSTALLATION IN 48 HOURS OR LESS OF A FORECAST RAIN.
3. NO AREA BEING DISTURBED SHALL EXCEED 50 ACRES AT ANY GIVEN TIME WITHOUT DEMONSTRATING TO THE SAN DIEGO COUNTY DPW DIRECTOR'S SATISFACTION THAT ADEQUATE EROSION AND SEDIMENT CONTROL CAN BE MAINTAINED. ANY DISTURBED AREA THAT IS NOT ACTIVELY GRADED FOR 10 DAYS MUST BE FULLY PROTECTED FROM EROSION. UNTIL ADEQUATE LONG TERM PROTECTIONS ARE INSTALLED, THE DISTURBED AREA SHALL BE INCLUDED WHEN CALCULATING THE ACTIVE DISTURBANCE AREA. ALL EROSION CONTROL MEASURES SHALL REMAIN INSTALLED AND MAINTAINED DURING ANY INACTIVE PERIOD.

EXISTING EASEMENT LIST
SEE FIRST AMENDED PRELIMINARY REPORT (P.R.) BY CHICAGO TITLE COMPANY, ORDER NO. 122007050-U50, DATED JANUARY 27, 2014. ITEMS LISTED BELOW ARE SHOWN IN THE P.R. AND AFFECT THE SUBJECT PROPERTY ASSESSOR'S PARCEL NO. 648-070-21. PLOTTABLE ITEMS ARE DENOTED THUS: (#) WITH LOCATION KEYED THE SAME HEREON.

(3) 20' WIDE EASEMENT TO OTAY MUNICIPAL WATER DISTRICT FOR PIPELINES. RECORDED JUNE 5, 1968 AS FILE NO. 93912, OF OFFICIAL RECORDS.

(4) 20' WIDE EASEMENT TO OTAY MUNICIPAL WATER DISTRICT FOR PIPELINES. RECORDED JANUARY 6, 1970 AS FILE NO. 2033, OF OFFICIAL RECORDS.

(5) 30' WIDE EASEMENT TO OTAY MUNICIPAL WATER DISTRICT FOR PIPELINES. RECORDED FEBRUARY 26, 1974 AS FILE NO. 74-051081, OF OFFICIAL RECORDS.

(6) 30' WIDE EASEMENT IN BENEFIT OF SUBJECT PROPERTY (SEE LEGAL DESCRIPTION, PARCEL 2) FOR INGRESS/EGRESS, PIPELINES, DRAINAGE AND/OR PUBLIC UTILITIES AND INCIDENTAL PURPOSES THERETO OVER, UNDER, ALONG AND ACROSS THE EASEMENT PARCEL(S) THEREIN DESCRIBED, AS GRANTED AND/OR RESERVED IN VARIOUS DEEDS OF RECORD.

(7) 40' WIDE EASEMENT TO SAN DIEGO GAS & ELECTRIC FOR PUBLIC UTILITIES. RECORDED MARCH 24, 1999, AS FILE NO. 1999-0191043, OF OFFICIAL RECORDS.

(8) IRREVOCABLE OFFER TO DEDICATE LAND FOR PUBLIC HIGHWAY TO COUNTY OF SAN DIEGO. RECORDED SEPTEMBER 22, 2011 AS FILE NO. 2011-0492241, OF OFFICIAL RECORDS.

(9) IRREVOCABLE OFFER TO DEDICATE LAND FOR SEWER PURPOSES TO COUNTY OF SAN DIEGO. RECORDED SEPTEMBER 22, 2011 AS FILE NO. 2011-0492242, OF OFFICIAL RECORDS.

EASEMENT NOTES
1. WITH THE APPROVAL OF THE FINAL MAP(S), FOR THE DRAINAGE TO MEXICO, EASEMENTS SHALL BE DEDICATED TO THE COUNTY OF SAN DIEGO OVER DETENTION BASINS, APPURTENANT STRUCTURES AND ACCESS ROUTES (SAID ROUTES NECESSARY TO MAINTAIN THE FOREGOING TO A COUNTY MAINTAINED ROAD. THIS REQUIRES HYDROLOGIC AND HYDRAULIC REPORTS TO ENSURE APPROPRIATE PRIVATE STORMWATER DETENTION FACILITIES SUCH THAT PEAK STORMWATER FLOWS FROM THE ENTIRE SITE REMAIN THE SAME AS BEFORE THE PROJECT WAS DEVELOPED. ALL OF THE FOREGOING SHALL BE TO THE SATISFACTION OF THE DIRECTOR OF PUBLIC WORKS.
2. ANY DESIGNATED BIOLOGICAL OPEN SPACE SHALL COMPLY WITH COVENANTS AND RESTRICTIONS IDENTIFIED IN THE OTAY BUSINESS PARK E.I.R. AND BIOLOGICAL REPORT.
3. LIMITED BUILDING ZONE. ALL LOTS AFFECTED SHALL COMPLY WITH BUILDING RESTRICTIONS AS IDENTIFIED IN THE OTAY BUSINESS BUSINESS PARK ENVIRONMENTAL IMPACT REPORT AND FIRE PROTECTION PLAN.

EROSION AND SEDIMENT CONTROL MEASURES NOTES:
1. ALL UTILITY TRENCHES SHALL BE BLOCKED AT THE PRESCRIBED INTERVALS WITH A DOUBLE ROW OF GRAVEL BAGS WITH A TOP ELEVATION TWO GRAVEL BAGS BELOW THE GRADED SURFACE OF THE STREET. GRAVEL BAGS ARE TO BE PLACED WITH LAPPED COURSES.
2. AFTER UTILITY TRENCHES ARE BACK FILLED AND COMPACTED, THE SURFACES OVER SUCH TRENCHES SHALL BE ROUNDED SLIGHT TO PREVENT CHANNELING OF WATER IN THE TRENCH AREA. CARE SHOULD BE EXERCISED TO PROVIDE FOR CROSS FLOW AT FREQUENT INTER INTERVALS WHERE TRENCHES ARE NOT ON THE CENTERLINE OF A CROWNED STREET.
3. ALL BUILDING PADS SHOULD BE SLOPED TOWARDS THE DRIVEWAYS AND VELOCITY CHECK DAMS PROVIDED AT THE END OF THE DRIVEWAY APRON OF ALL BUILDINGS DRAINING INTO THE STREET.
4. PROVIDE VELOCITY CHECK DAMS IN ALL UNPAVED GRADED CHANNELS.
5. PROVIDE VELOCITY CHECK DAMS IN ALL STREET AREAS. VELOCITY CHECK DAMS MAY BE CONSTRUCTED OF GRAVEL BAGS, TIMBER, OR OTHER EROSION RESISTANT MATERIAL APPROVED BY THE COUNTY ENGINEER, AND SHALL EXTEND COMPLETELY ACROSS THE STREET OR CHANNEL AT RIGHT ANGLES TO THE CENTERLINE. VELOCITY CHECK DAMS MAY ALSO SERVE AS SEDIMENT TRAPS.
6. GRAVEL BAGS AND FILL MATERIAL SHALL BE STOCKPILED AT INTERVALS, READY FOR USE WHEN REQUIRED.
7. ALL EROSION CONTROL DEVICES WITHIN THE DEVELOPMENT SHOULD BE MAINTAINED DURING AND AFTER EVERY RUNOFF PRODUCING STORM. IF POSSIBLE, MAINTENANCE CREWS WOULD BE REQUIRED TO HAVE ACCESS TO ALL AREAS.
8. ANY PROPOSED ALTERNATE CONTROL MEASURES MUST BE APPROVED IN ADVANCE BY ALL RESPONSIBLE AGENCIES; I.E., COUNTY ENGINEER, DEPARTMENT OF SANITATION AND FLOOD CONTROL, OFFICE OF ENVIRONMENTAL MANAGEMENT, ETC.
9. PHYSICAL STABILIZATION THROUGH USE OF GEOTEXTILES, MATS, FIBER ROLLS (SS-7 OR ESC20), BONDED FIBER MATRIX OR OTHER MATERIAL APPROVED BY THE COUNTY FOR STABILIZING SLOPES.
10. VEGETATION STABILIZING USING HYDROSEED (SS-4 OR ESC10) OR ACCEPTABLE LANDSCAPING MAY BE USED ONLY MAY 1 TO AUGUST 15. VEGETATION PROPOSED TO STABILIZE SLOPES MUST BE INSTALLED BY AUGUST 15, WATERED AND ESTABLISHED PRIOR TO OCTOBER 1. THE PROPERTY OWNER OR AUTHORIZED AGENT SHALL SHOW ON THE PLAN A CONTINGENCY PHYSICAL BMP TO BE INSTALLED BY OCTOBER 1 IF HYDROSEED ESTABLISHMENT DOES NOT OCCUR BY THAT DATE. IF LANDSCAPING IS PROPOSED, EROSION CONTROL MEASURES MUST ALSO BE USED WHILE LANDSCAPING IS BEING ESTABLISHED. ESTABLISHED VEGETATION SHALL HAVE A SUBSURFACE MAT OF INTERTWINED MATURE ROOTS WITH A UNIFORM VEGETATIVE COVERAGE OF 70 PERCENT OF THE NATURAL VEGETATIVE COVERAGE OR MORE ON ALL DISTURBED AREAS.
11. ALL MANUFACTURED SLOPES AND CLEARED SLOPES OF 3 TO 1 (HORIZONTAL TO VERTICAL) AND STEEPER ARE TO BE PROTECTED WITH A BMP APPROVED BY THE COUNTY OF SAN DIEGO. CLEARED SLOPES FLATTER THAN 3 TO 1 MUST STILL BE PROTECTED FROM EROSION USING EITHER AN APPROVED BMP OR BY USING HYDROMULCH WITH A GUAR BINDER. FLAT AREAS OF LESS THAN 5% (UKE BUILDING PADS, PARKING AREAS, LEACH FIELDS) SHALL HAVE 100% PROTECTION USING GEOTEXTILES, MATS (SS-7 OR ESC20), OR OTHER MATERIAL APPROVED BY THE COUNTY FOR STABILIZING SLOPES, OR USING TRACKING AND SOIL STABILIZERS/BINDERS (SC-5). TEMPORARY SEEDING (SS-4), MULCH/WOOD CHIPS (SS-3, SS-6, SS-8), OR JUTE MATTING (SS-7). THE COUNTY MAY REDUCE THIS REQUIREMENT FOR FLAT AREAS AND THE BELOW REQUIREMENT, PROVIDED FULL SEDIMENT CONTROL IS PROVIDED THROUGH CONSTRUCTED AND MAINTAINED DESILTATION BASINS (SC-2) AT ALL PROJECT DISCHARGE POINTS.
12. AREAS OF GRADED PADS THAT HAVE ACTIVE STRUCTURE CONSTRUCTION UNDERWAY MAY BE PROTECTED BY ROLLED PLASTIC AS PART OF A WEATHER-TRIGGERED ACTION PLAN UNTIL THE STRUCTURE'S ROOF HAS BEEN COMPLETED. THE REMAINDER OF THE PAD AREA MUST CONTINUE TO BE PROTECTED USING EROSION CONTROL MEASURES IDENTIFIED ABOVE.
13. UNPAVED ROADS SHALL HAVE APPROPRIATE BMP'S INSTALLED SUCH AS GRAVEL BAG CHEVRONS.

SHEET INDEX

WORK TO BE DONE
THE IMPROVEMENTS CONSIST OF THE FOLLOWING WORK TO BE DONE ACCORDING TO THESE PLANS AND THE SPECIFICATIONS AND STANDARD DRAWINGS OF THE COUNTY OF SAN DIEGO.

STANDARD SPECIFICATIONS:
1. STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION "GREEN BOOK" (LATEST EDITION), INCLUDING THE REGIONAL AND CITY OF SAN DIEGO SUPPLEMENT AMENDMENT.
2. SAN DIEGO COUNTY GRADING ORDINANCE.
3. CALIFORNIA DEPARTMENT OF TRANSPORTATION, " MANUAL OF TRAFFIC CONTROLS FOR CONSTRUCTION AND MAINTENANCE WORK ZONES," (LATEST EDITION).
4. STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION, STANDARD SPECIFICATIONS (LATEST EDITION).

STANDARD DRAWINGS:
1. THE CURRENT SAN DIEGO AREA REGIONAL STANDARD DRAWINGS.
2. STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION, STANDARD PLAN (LATEST EDITION).

LEGEND

DESCRIPTION	SYMBOL
PROPOSED LOT NUMBER	(1)
SUBDIVISION BOUNDARY	
INTERNATIONAL BORDER	
EXISTING CONTOUR	330
PROPOSED LOT LINE	
PROPOSED RIGHT-OF-WAY	
PROPOSED RIGHT-OF-WAY SR-11	
EXISTING EASEMENT	
FUTURE RIGHT-OF-WAY	
EXISTING WATER LINE	W
PROPOSED SEWER LINE	S
PROPOSED WATER LINE	W
PROPOSED STORM DRAIN	SD
PROPOSED EASEMENT	
PROPOSED WING-TYPE HEADWALL	
PROPOSED CATCH BASIN	
RIP RAP	
PROPOSED FORCE MAIN	SFM
PROPOSED PUMP STATION	PS
SLOPE RATIO	2:1 MAX FILL 2:1 MAX CUT
PROPOSED CONTOUR	500
DAYLIGHT LINE	
FLOWAGE	
DRIVEWAY LOCATION (APPROXIMATE – SEE GENERAL NOTE 13 BELOW)	*

SCALE: 1"=200'

KEY NOTES
(1) PROPOSED DRAINAGE DETENTION BASIN (HYDROMODIFICATION BMP)
(2) SEE PRELIMINARY ROUTE STUDIES FOR ROADWAY ELEVATION ON CIRCULATION ELEMENT ROADWAYS.
(3) PROPOSED 20' WIDE ACCESS AND UTILITY EASEMENT.
(4) PROPOSED 30' WIDE ACCESS AND UTILITY EASEMENT.
(5) DRAINAGE DETENTION BASIN MAINTENANCE ACCESS ROAD PER COUNTY OF SAN DIEGO STANDARDS.

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THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 18 SOUTH, RANGE 1 EAST, SAN BERNARDINO BASE AND MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF.

EXCEPTING THEREFROM THAT PORTION CONVEYED TO UNITED STATES OF AMERICA, IMMIGRATION AND NATURALIZATION SERVICE BY DEED RECORDED APRIL 7, 2000, AS FILE NO. 2000-0177412, OFFICIAL RECORDS.

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AN EASEMENT FOR INGRESS AND EGRESS OVER THE EASTERLY 30 FEET OF THE WEST ONE-HALF OF SECTION 31, TOWNSHIP 18 SOUTH, RANGE 1 EAST, SAN BERNARDINO BASE AND MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF.

ASSESSOR'S PARCEL NUMBER
648-070-21

BASIS OF BEARINGS
THE BASS OF BEARINGS FOR THIS SURVEY IS THE NAD 83, ZONE 6 GRID BEARING BETWEEN CITY OF SAN DIEGO CONTROL MONUMENTS 1494 AND 1496 AS SHOWN ON RECORD OF SURVEY 14492 BEARING: NORTH 44°35'23" WEST

GRADING QUANTITIES
GRADED AREA (ONSITE): 161.60± ACRES
CUT QUANTITIES: 1,135,000 CYD
FILL QUANTITIES: 1,135,000 CYD
IMPORT/EXPORT: 0 CYD
NOTE: GRADING QUANTITIES ARE ESTIMATED FOR PERMIT PURPOSES ONLY AND ARE NOT INTENDED TO BE USED AS FINAL PAY QUANTITIES.

GENERAL NOTES (PRELIMINARY GRADING)
1. THIS "PRELIMINARY GRADING PLAN" DOES NOT CONSTITUTE A CONSTRUCTION DOCUMENT. A FINAL GRADING PLAN, PREPARED (TO THE SATISFACTION OF THE DIRECTOR OF PUBLIC WORKS) IN ACCORDANCE WITH COUNTY GRADING ORDINANCE SHALL BE SUBMITTED TO THE DEPARTMENT OF PUBLIC WORKS. APPROVAL OF THE FINAL GRADING PLAN SHALL BE REQUIRED AND GRADING PERMIT ISSUED PRIOR TO ANY WORK IN THE FIELD.
2. A CONSTRUCTION, EXCAVATION OR ENCROACHMENT PERMIT FROM THE DIRECTOR OF PUBLIC WORKS WILL BE REQUIRED FOR ANY WORK IN THE COUNTY RIGHT-OF-WAY.
3. ALL SLOPES OVER 3 FEET IN HEIGHT SHALL BE PLANTED IN ACCORDANCE WITH SAN DIEGO COUNTY SPECIFICATIONS.
4. A SOILS REPORT SHALL BE REQUIRED PRIOR TO THE ISSUANCE OF A GRADING AND/OR BUILDING PERMIT.
5. APPROVAL OF THESE PLANS BY THE DIRECTOR OF PUBLIC WORKS DOES NOT AUTHORIZE ANY WORK OR GRADING TO BE PERFORMED UNTIL THE PROPERTY OWNER'S PERMISSION HAS BEEN OBTAINED AND A VALID GRADING PERMIT HAS BEEN ISSUED.
6. THE DIRECTOR OF PUBLIC WORKS APPROVAL OF THESE PLANS DOES NOT CONSTITUTE COUNTY BUILDING OFFICIAL APPROVAL OF ANY FOUNDATIONS FOR STRUCTURES TO BE PLACED ON THE AREA COVERED BY THESE PLANS. NO WAIVER OF THE GRADING ORDINANCE REQUIREMENTS CONCERNING MINIMUM COVER OVER EXPANSIVE SOILS IS MADE OR IMPLIED (SECTIONS 87.403 & 87.410). ANY SUCH WAIVER MUST BE OBTAINED FROM THE DIRECTOR OF DPLU.
7. ALL SLOPES SHALL BE ROUNDED INTO EXISTING TERRAIN TO PRODUCE A CONTOURED TRANSITION FROM CUT OR FILL FACES TO NATURAL GROUND AND ADJUSTING CUT OR FILL SURFACES.
8. NOTWITHSTANDING THE MINIMUM STANDARDS SET FORTH IN THE GRADING ORDINANCE AND NOTWITHSTANDING THE APPROVAL OF THESE PRELIMINARY GRADING PLANS, THE PERMITTEE IS RESPONSIBLE FOR THE PREVENTION OF DAMAGE TO THE ADJACENT PROPERTY. NO PERSON SHALL EXCAVATE ON LAND SO CLOSE TO THE PROPERTY LINE AS TO ENDANGER ANY ADJOINING PUBLIC STREET, SIDEWALK, ALLEY, FUNCTION OF ANY SEWAGE DISPOSAL SYSTEM, OR ANY OTHER PUBLIC OR PRIVATE PROPERTY, WITHOUT SUPPORTING AND PROTECTING SUCH PROPERTY FROM SETTLING, CRACKING, EROSION, SILTING, SCOUR OR OTHER DAMAGE WHICH MIGHT RESULT FROM THE GRADING DESCRIBED ON THIS PLAN. THE COUNTY WILL HOLD THE PERMITTEE RESPONSIBLE FOR CORRECTION OF NON-DEDICATED IMPROVEMENTS WHICH DAMAGE ADJACENT PROPERTY.
9. ALL GRADING DETAILS WILL BE IN ACCORDANCE WITH SAN DIEGO COUNTY STANDARD DRAWINGS DS-8, DS-10, DS-11, D-75 UNLESS SHOWN OTHERWISE ON THESE PLANS.
10. SLOPE RATIOS:
    CUT – 2:1
    FILL – 2:1
    DEVIATING FROM THE ABOVE RATIOS WILL REQUIRE APPROVAL OF THE DIRECTOR OF PUBLIC WORKS AFTER REVIEW OF A REPORT FROM A SOILS ENGINEER.
11. EARTHWORK QUANTITIES:
    CUT: 1,135,000± CY
    FILL: 1,135,000± CY
    IMPORT/EXPORT: 0 C.Y.
    A SEPARATE PERMIT MUST BE OBTAINED FOR WASTE OR IMPORT AREA.
    GRADING QUANTITIES ARE APPROXIMATE AND ARE PROVIDED HEREON FOR PERMIT PURPOSES ONLY. QUANTITIES ARE BASED ON THE DIFFERENCE BETWEEN THE EXISTING SURFACES AND PROPOSED PAD/SUBGRADE SURFACES. VARIATIONS DUE TO LOSS FROM CLEARING AND GRUBBING, STRIPPING, SHRINKAGE, SWELL, UNSUITABLE MATERIAL & REMEDIAL GRADING ARE NOT CONSIDERED NOR FACTORED INTO THESE QUANTITIES. CONTRACTOR SHALL VERIFY QUANTITIES WITH THEIR OWN VOLUME CALCULATIONS. CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THEIR OWN INDEPENDENT QUANTITY AND MATERIAL TAKE OFFS AND CONSTRUCT THE DESIGN INDICATED ON THESE DRAWINGS. PROJECT TO BE BID BASED ON CONTRACTOR'S OWN ESTIMATES.
12. SPECIAL CONDITION: IF ANY ARCHAEOLOGICAL RESOURCES ARE DISCOVERED ON THE SITE OF THIS GRADING DURING GRADING OPERATIONS, SUCH OPERATIONS WILL CEASE IMMEDIATELY, AND THE PERMITTEE WILL NOTIFY THE DIRECTOR OF PUBLIC WORKS OF THE DISCOVERY. GRADING OPERATIONS WILL NOT RECOMMENCE UNTIL THE PERMITTEE HAS RECEIVED WRITTEN AUTHORITY FROM THE DIRECTOR OF PUBLIC WORKS TO DO SO.
13. PROPOSED DRIVEWAY LOCATIONS SHOWN HEREON ARE APPROXIMATE. PRIVATE DRIVEWAY LOCATIONS MAY VARY FROM THE LOCATIONS SHOWN HEREON DEPENDANT UPON THE NEEDS OF FUTURE DEVELOPMENT OF INDIVIDUAL LOTS AND ARE SUBJECT TO A SITE DEVELOPMENT PLAN REVIEW AND APPROVAL.

REVISIONS	BY

STEVENS · CRESTO ENGINEERING, INC.
CIVIL ENGINEERS · PLANNERS · LAND SURVEYORS
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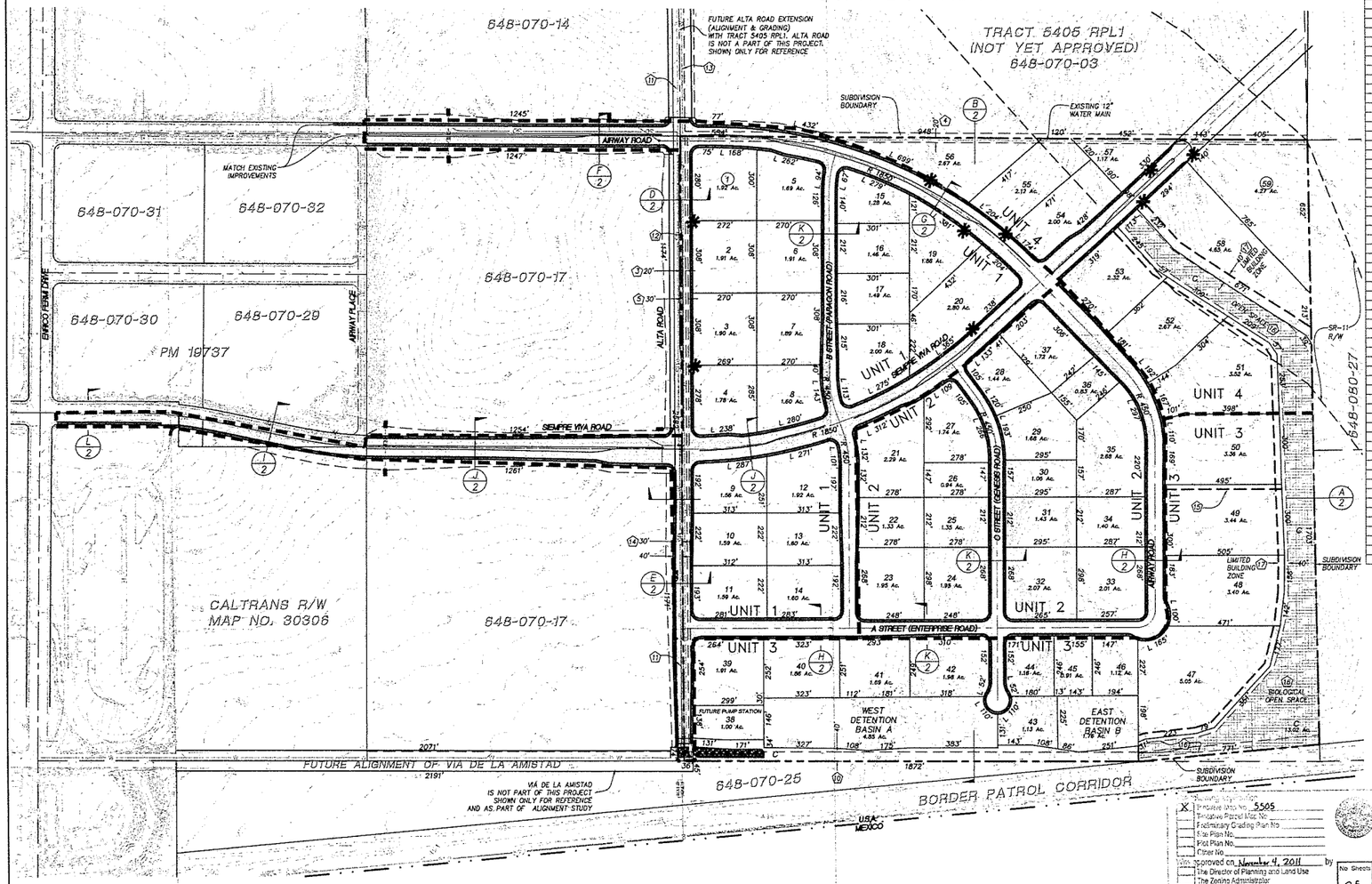
REGISTERED PROFESSIONAL ENGINEER
SUE E. STEVENS
No. 35502
Exp. 9-30-15
CIVIL
STATE OF CALIFORNIA

PRELIMINARY GRADING PLAN

SAN DIEGO
OTAY BUSINESS PARK
COUNTY OF SAN DIEGO, CALIFORNIA

Date:	FEBRUARY 2014
Scale:	AS SHOWN
Drawn:	SCE
Job:	12009.02
Sheet	C-3
	3 of 10 Sheets

COUNTY OF SAN DIEGO TRACT 5505
REPLACEMENT TENTATIVE MAP
OTAY BUSINESS PARK



LOT AREAS	
NO.	NET ACREAGE
1	1.92
2	1.91
3	1.90
4	1.78
5	1.69
6	1.91
7	1.89
8	1.60
9	1.56
10	1.59
11	1.59
12	1.92
13	1.60
14	1.60
15	1.28
16	1.46
17	1.49
18	2.00
19	1.86
20	2.80
21	2.29
22	1.33
23	1.95
24	1.95
25	1.35
26	0.94
27	1.74
28	1.44
29	1.68
30	1.06
31	1.43
32	2.07
33	2.01
34	1.40
35	2.68
36	0.83
37	1.72
38	1.00
39	1.91
40	1.86
41	1.69
42	1.98
43	1.13
44	1.16
45	0.91
46	1.12
47	5.05
48	3.40
49	3.44
50	3.36
51	3.52
52	2.67
53	2.32
54	2.00
55	2.12
56	2.67
57	1.17
58	4.65
59	4.27
LOT AREA	116.62 AC.
A	4.85
B	1.76
C	13.02
ANCILLARY AREA	19.63 AC.
ON SITE ROAD AREA	25.35 AC.
TOTAL PROJECT AREA	161.6 ±AC.

LOT / UNIT TABLE	
LOTS 1–20	UNIT NO. 1
LOTS 21–37	UNIT NO. 2
LOTS 38–50	UNIT NO. 3
LOTS 51–59	UNIT NO. 4

LEGEND

DESCRIPTION	SYMBOL
PROPOSED LOT NUMBER	1
SUBDIVISION BOUNDARY	
INTERNATIONAL BORDER	
EXISTING CONTOUR	330
PROPOSED LOT LINE	
PROPOSED RIGHT-OF-WAY	
PROPOSED RIGHT-OF-WAY SR-11	
EXISTING WATER LINE	W
PROPOSED SEWER LINE	S
PROPOSED WATER LINE	W
PROPOSED RECLAIMED WATER LINE	R
PROPOSED STORM DRAIN	SD SD
PROPOSED STORM DRAIN SIZE	XX" SD
PROPOSED EASEMENT	
PROPOSED WING-TYPE HEADWALL	
PROPOSED CATCH BASIN	
PROPOSED FORCE MAIN	FM FM
PROPOSED PUMP STATION	PS
SLOPE RATIO	2:1 MAX FILL 1.5:1 MAX CUT
PROPOSED STREET LIGHT	H
PHASING LINE	
PROPOSED CONTOUR	330
RIP RAP	
DAYLIGHT LINE	
DESILT BASINS	
VEGETATED SWALE (PRIVATELY MAINTAINED)	
ACCESS DRIVEWAY EXCEPTIONS (APPROXIMATE LOCATIONS)	*
BIOLOGICAL OPEN SPACE (SEE NOTE THIS SHEET)	

SHEET INDEX

GENERAL NOTES:

1. GROSS ACREAGE WITHIN SUBDIVISION BOUNDARY: 161.6± ACRES
   GROSS DEVELOPABLE LOT AREA: 116.4 ACRES
   PROPOSED ON-SITE STREETS: 25.4 ACRES
   PROPOSED ON-SITE DETENTION BASINS: 6.61 ACRES
   PROPOSED ON-SITE DRAINAGE CHANNEL: 13.0 ACRES
   PROPOSED PUMP STATION: 1.0 ACRES
2. TOTAL NUMBER OF LOTS: 59 COMMERCIAL/INDUSTRIAL LOTS
   2 ON-SITE DETENTION BASINS, 1 ON-SITE PUMP STATION
   MINIMUM INDUSTRIAL LOT SIZE IS 0.90 ACRES
3. EXISTING ZONING – S-88
4. PROPOSED ZONING – S-88
5. GENERAL PLAN REGIONAL CATEGORY: VILLAGE
6. GENERAL PLAN LAND USE DESIGNATION: SPECIFIC PLAN AREA
7. COMMUNITY PLAN OR SUBREGIONAL PLAN: OTAY SUBREGIONAL PLAN, EAST OTAY MESA SPECIFIC PLAN
8. SPECIAL ASSESSMENT ACT PROCEEDINGS – MAY BE REQUESTED FOR THIS PROJECT.
9. PARK LAND DEDICATION NOT REQUIRED IN AN INDUSTRIAL ZONE.
10. STREET LIGHTS WILL BE INSTALLED TO COMPLY WITH THE REQUIREMENTS SPECIFIED BY THE COUNTY STANDARDS.
11. ALL LOTS WITHIN THIS SUBDIVISION HAVE A MINIMUM OF 100 SQUARE FEET OF SOLAR ACCESS FOR EACH FUTURE DWELLING/COMMERCIAL/INDUSTRIAL UNIT ALLOWED BY THIS SUBDIVISION.
12. SOURCE OF TOPOGRAPHY:
    PREPARED BY PHOTO GEODETIC CORPORATION. TOPOGRAPHIC INFORMATION FLOWN ON OCTOBER 15, 2009
13. DISTRICTS: SEWER – SAN DIEGO COUNTY SANITATION DISTRICT
    WATER – OTAY WATER DISTRICT
    GAS & ELECTRIC – SDG&E
    TELEPHONE – AT&T
    FIRE – SAN DIEGO RURAL FIRE PROTECTION DISTRICT
    STREET LIGHTING – COUNTY OF SAN DIEGO
14. ALL PROPOSED UTILITIES TO BE UNDERGROUND EXCEPT WATER TREATMENT SWALES.
15. ALL ONSITE STREETS WILL BE PUBLIC.
16. IMPROVEMENTS, EASEMENTS AND DEDICATIONS WILL COMPLY WITH THE REQUIREMENTS SPECIFIED IN THE COUNTY STANDARDS.
17. ALL EXISTING EASEMENTS NOT REVAINING IN USE SHALL BE VACATED PRIOR TO RECORDATION OF THE FINAL MAP(S) SUBJECT TO THE SATISFACTION THE DIRECTOR OF PUBLIC WORKS.
18. STORM DRAIN DETENTIONS SHALL BE PROVIDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE EAST OTAY MESA SPECIFIC PLAN. THIS DETENTION WILL BE ACCOMPLISHED THROUGH UTILIZATION OF 2 DETENTION BASINS TO SERVE THE OVERALL PROJECT.
19. LAMBERT COORDINATES: 138-1785
20. THIS PLAN IS PROVIDED TO ALLOW FOR FULL AND ADEQUATE DISCRETIONARY REVIEW OF A PROPOSED DEVELOPMENT PROJECT. THE PROPERTY OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE AN APPROVAL TO PERFORM ANY GRADING SHOWN HEREON, AND AGREES TO OBTAIN VALID GRADING PERMISSIONS BEFORE COMMENCING SUCH ACTIVITY.
21. THIS PROJECT IS A MULTI-UNIT SUBDIVISION. MULTIPLE FINAL MAPS MAY BE FILED PURSUANT TO SECTION 66456.1 OF THE SUBDIVISION MAP ACT
22. PRIOR TO THE APPROVAL OF ANY SITE PLAN FOR ANY DEVELOPMENT PROPOSAL WITHIN THE NOISE PROTECTION EASEMENT, THE APPLICANT SHALL:

    M-N-2: THE PERMIT COMPLIANCE ENGINEER SHALL ENSURE THAT ON-SITE GRADING OPERATIONS DO NOT OCCUR WITHIN 225 FEET OF ANY PROPERTY LINE THAT ABUTS PROPERTIES WHERE ACTIVE GRADING ACTIVITIES ARE OCCURRING. ON-SITE GRADING ACTIVITIES ADJACENT TO THE PROPERTY LINE MAY OCCUR IF GRADING ACTIVITIES FOR ADJACENT PROPERTIES ARE OCCURRING AT A MINIMUM DISTANCE OF 225 FEET FROM THE SHARED PROPERTY LINE. THE PERMIT COMPLIANCE ENGINEER (AS DEFINED IN SECTION 87.420 OF THE COUNTY GRADING ORDINANCE) SHALL DEMONSTRATE COMPLIANCE WITH THIS REQUIREMENT IN THE REGULAR REPORTS REQUIRED PURSUANT TO SECTION 87.420(e) OF THE COUNTY'S GRADING ORDINANCE. THE REGULAR REPORTS SHALL IDENTIFY ANY DATES WHERE GRADING ACTIVITIES WERE RESTRICTED ON-SITE OR ON ADJACENT PROPERTIES IN ORDER TO ENSURE A MINIMUM DISTANCE OF 225 FEET BETWEEN GRADING ACTIVITIES.

Tentative Map No. 5505
Tentative Parcel Map No.
Preliminary Grading Plan No.
Site Plan No.
Plot Plan No.
Other No.
Approved on November 4, 2011 by
The Director of Planning and Land Use
The Zoning Administrator
The San Diego Planning Commission
The Board of Supervisors

No. Sheets 25

Project Planning Chief
Title

EASEMENTS / EXCEPTIONS / RESTRICTIONS

WITH THE APPROVAL OF THE FINAL MAP(S), FOR THE DRAINAGE TO MEXICO EASEMENTS SHALL BE DEDICATED TO THE COUNTY OF SAN DIEGO OVER DETENTION BASINS, APPURTENANT STRUCTURES AND ACCESS ROUTES (SAID ROUTES NECESSARY TO MAINTAIN THE FOREGOING) TO A COUNTY MAINTAINED ROAD. THIS REQUIRES HYDROLOGIC AND HYDRAULIC REPORTS TO ENSURE APPROPRIATE PRIVATE STORMWATER DETENTION FACILITIES SUCH THAT PEAK STORMWATER FLOWS FROM THE ENTIRE SITE REMAIN THE SAME AS BEFORE THE PROJECT WAS DEVELOPED. ALL OF THE FOREGOING SHALL BE TO THE SATISFACTION OF THE DIRECTOR OF PUBLIC WORKS.

SEE PRELIMINARY TITLE REPORT BY STEWART TITLE OF CALIFORNIA, INC., ORDER NO. 01-0251783, DATED NOVEMBER 7 2005. ITEMS LISTED BELOW ARE SHOWN IN THE PRELIMINARY TITLE REPORT WHICH EFFECTS ASSESSOR'S PARCEL NO 648-070-21. PLOTTABLE ITEMS ARE DENOTED THUS: X WITH LOCATIONS KEYED THE SAME HEREON.

(3) AN EASEMENT TO OTAY MUNICIPAL WATER DISTRICT FOR THE CONSTRUCTION AND MAINTENANCE OF PIPELINES, RECORDED JUNE 5, 1958 AS FILE NO. 93912, OF OFFICIAL RECORDS.

(4) AN EASEMENT TO OTAY MUNICIPAL WATER DISTRICT FOR THE CONSTRUCTION AND MAINTENANCE OF PIPELINES, RECORDED JANUARY 6, 1970 AS FILE NO. 2033, OF OFFICIAL RECORDS.

(5) AN EASEMENT TO OTAY MUNICIPAL WATER DISTRICT FOR THE CONSTRUCTION AND MAINTENANCE OF PIPELINES, RECORDED FEBRUARY 26, 1974 AS FILE NO. 74-051081, OF OFFICIAL RECORDS.

(9) THE EFFECT OF A DOCUMENT OF JOINT USE BETWEEN SAN DIEGO GAS & ELECTRIC AND OTAY WATER DISTRICT, RECORDED JANUARY 11, 1999, AS FILE NO. 1999-0036773, OF OFFICIAL RECORDS, UNPLOTTABLE.

(10) 40' EASEMENT TO SAN DIEGO GAS & ELECTRIC FOR PUBLIC UTILITIES, RECORDED MARCH 24, 1999, AS FILE NO. 1999-0191043, OF OFFICIAL RECORDS.

(11) EXISTING 24" ACP TIJUANA WATER MAIN PER O.M.W.D. DWG. 16-3-7

(12) EXISTING 12" WATER MAIN PER O.M.W.D. DWG 16-7-7

(13) EXISTING 16" WATER MAIN PER O.M.W.D.DWG 16-7-7

(14) 30' INGRESS/EGRESS IN BENEFIT OF SUBJECT PROPERTY (SEE LEGAL DESCRIPTION, PARCEL 2)

EASEMENTS / EXCEPTIONS / RESTRICTIONS (CONTINUED)

(15) A 20' SEWER ACCESS AND MAINTENANCE EASEMENT TO COUNTY OF SAN DIEGO.

(16) DESIGNATED BIOLOGICAL OPEN SPACE SHALL COMPLY WITH COVENANTS AND RESTRICTIONS IDENTIFIED IN THE OTAY BUSINESS PARK EIR AND BIOLOGICAL REPORT

(17) LIMITED BUILDING ZONE. ALL LOTS AFFECTED SHALL COMPLY WITH BUILDING RESTRICTIONS AS IDENTIFIED IN THE OTAY BUSINESS PARK ENVIRONMENTAL IMPACT REPORT AND FIRE PROTECTION PLAN.

GRADING QUANTITIES

GRADED AREA 161.60 ACRES
CUT QUANTITIES 1,200,000 CYD
FILL QUANTITIES 1,200,000 CYD
IMPORT/EXPORT 0 CYD

NOTE: GRADING QUANTITIES ARE ESTIMATED FOR PERMIT PURPOSES ONLY AND ARE NOT INTENDED TO BE USED AS FINAL PAY QUANTITIES.

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE NAD 83, ZONE 6 GRID BEARING BETWEEN CITY OF SAN DIEGO CONTROL MONUMENTS 1494 AND 1496 AS SHOWN ON RECORD OF SURVEY 14492 BEARING: NORTH 44°35'23" WEST

OWNER/SUBDIVIDER

OTAY BUSINESS PARK
4370 LA JOLLA VILLAGE DRIVE, SUITE 640
SAN DIEGO, CA 92122
PHONE: (858) 535-9047
FAX: (858) 535-9100

RICARDO JINICH — DATE 10/14/2011

ASSESSOR'S PARCEL NUMBER
648-070-21

TAX RATE AREA
84035

ZONING APN 648-070-21

ZONE		
USE REGULATIONS		S88
ANIMAL REGULATIONS		–
DEVELOPMENT REGULATIONS	DENSITY	–
	LOT SIZE	30,000
	BUILDING TYPE	W
	MAX. FLOOR AREA	–
	FLOOR AREA RATIO	0.40
	HEIGHT	R
	LOT COVERAGE	0.40
	SETBACK	V
	OPEN SPACE	–
SPECIAL AREA REGULATIONS		B, P or G

LEGAL DESCRIPTION

PARCEL 1:

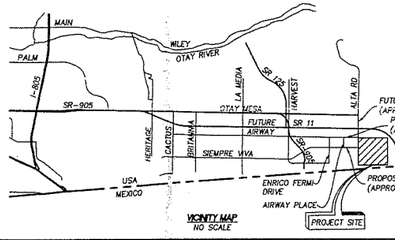
THE SOUTHEAST QUARTER OF SECTION 31, TOWNSHIP 18 SOUTH, RANGE 1 EAST, SAN BERNARDINO BASE AND MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF.

EXCEPTION THEREFROM THAT PORTION CONVEYED TO UNITED STATES OF AMERICA, IMMIGRATION AND NATURALIZATION SEVICE BE DEED RECORDED APRIL 7, 2000, AS FILE NO. 2000-0177412, OFFICIAL RECORDS.

PARCEL 2:

AN EASEMENT FOR INGRESS AND EGRESS OVER THE EASTERLY 30 FEET OF THE WEST ONE-HALF OF SECTION 31, TOWNSHIP 18 SOUTH, RANGE 1 EAST, SAN BERNARDINO BASE AND MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF.

GRAPHIC SCALE
200 0 100 200 400
1 INCH = 200 FEET



VICINITY MAP
NO SCALE

REVISIONS	BY

Kimley-Horn and Associates, Inc.
© 2010 KIMLEY-HORN AND ASSOCIATES, INC.
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4225 Executive Square, Suite 600
San Diego, California 92101
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REGISTERED PROFESSIONAL ENGINEER — No. C71634 — CIVIL — STATE OF CALIFORNIA

TITLE SHEET

SAN DIEGO
OTAY BUSINESS PARK
COUNTY OF SAN DIEGO, CALIFORNIA

SDC DPLU RCVD 10-17-11
TM5505

Date:	JULY 2008
Scale:	AS SHOWN
Drawn:	SEB
Job:	095529000
Sheet	C-1

1 of 20 Sheets

* APPROVED TM * FOR RELEASE ONLY

ATTACHMENT B

Source Control Exhibit

LEGEND

PROPOSED LOT NUMBER — 1 THRU 34

SUBDIVISION BOUNDARY

PROPOSED LOT LINE

PROPOSED RIGHT-OF-WAY

PROPOSED CONTOUR — 630

PROPOSED STORM DRAIN — SD

PROPOSED STORM DRAIN INLET

PROPOSED STORM DRAIN HEADWALL/ ENERGY DISSIPATOR — SD

RUNOFF FLOW DIRECTION

STORM WATER COLLECTION BASIN

SOURCE CONTROL BMPS

STORM DRAIN INLET
(EACH INLET WILL BE MARKED WITH, "NO DUMPING! FLOWS TO OCEAN", OR SIMILAR)

VEGETATED STORM WATER DETENTION FACILITY (DETENTION FACILITIES WILL CONTAIN PLANTS TOLERANT OF SATURATED SOIL CONDITIONS)

VEGETATED SLOPES
(WILL BE HYDROSEEDED WITH NATIVE / DROUGHT TOLERANT PLANTS. PESTICIDES/ FERTILIZERS WILL BE USED AT A MINIMUM AND ONLY ON AN AS-NEEDED BASIS)

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OTAY BUSINESS PARK TRACT 5505R

SAN DIEGO, CALIFORNIA

ATTACHMENT "B" STORM WATER MANAGEMENT PLAN SOURCE CONTROL EXHIBIT

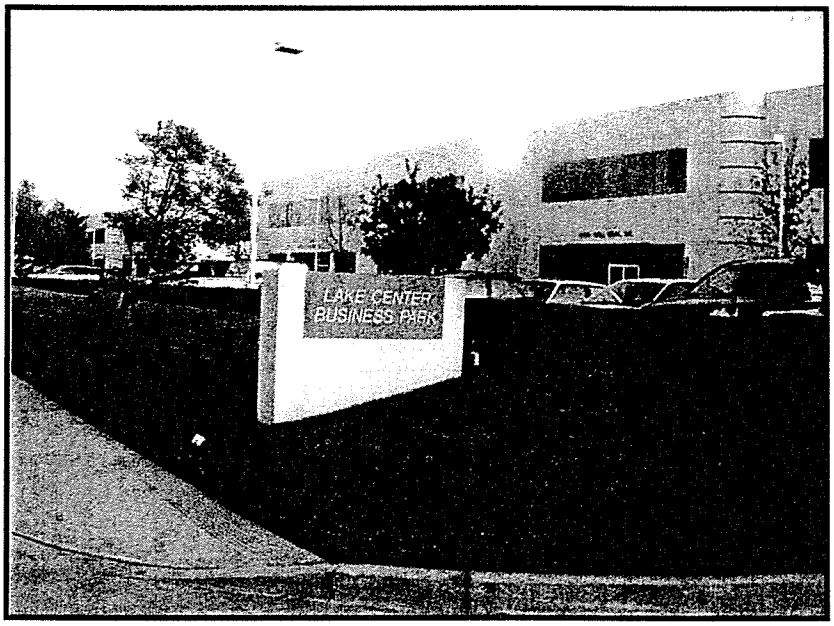
DATE: 01/31/14

SCE NO. 12009.02

SHEET B

1 OF 1 SHEET

Building & Grounds Maintenance SC-41



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	
Organics	

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.

CASQA California Stormwater Quality Association

- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.

Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.
- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

Landscaping Activities

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.
- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabric or use other sediment filters or traps.
- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures when soils are exposed.
- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.
- Use hand weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.
- Do not use pesticides if rain is expected.
- Do not mix or prepare pesticides for application near storm drains.
- Use the minimum amount needed for the job.
- Calibrate fertilizer distributors to avoid excessive application.
- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.
- Apply pesticides only when wind speeds are low.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Irrigate slowly to prevent runoff and then only as much as is needed.
- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Dispose of empty pesticide containers according to the instructions on the container label.

- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering and repair leaks in the irrigation system as soon as they are observed.

Training

- Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.
- Train employees and contractors in proper techniques for spill containment and cleanup.
- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.
- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.
- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.
- Clean up spills immediately.

Other Considerations

Alternative pest/weed controls may not be available, suitable, or effective in many cases.

Requirements

Costs

- Cost will vary depending on the type and size of facility.
- Overall costs should be low in comparison to other BMPs.

Maintenance

Sweep paved areas regularly to collect loose particles. Wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping, but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Mobile Cleaners Pilot Program: Final Report. 1997. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Drainage System Maintenance SC-44

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and stormwater that may contain certain pollutants. The protocols in this fact sheet are intended to reduce pollutants reaching receiving waters through proper conveyance system operation and maintenance.

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	
Bacteria	✓
Oil and Grease	
Organics	

Approach

Pollution Prevention

Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Suggested Protocols

Catch Basins/Inlet Structures

- Staff should regularly inspect facilities to ensure compliance with the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC34 Waste Handling and Disposal).

CASQA California Stormwater Quality Association

- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.
- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.
- Conduct routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a Steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS.

Illicit Connections and Discharges

- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:
  - Is there evidence of spills such as paints, discoloring, etc?

- Are there any odors associated with the drainage system?
- Record locations of apparent illegal discharges/illicit connections?
- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
- Eliminate the discharge once the origin of flow is established.

- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Allow only properly trained individuals to handle hazardous materials/wastes.
- Have staff involved in detection and removal of illicit connections trained in the following:
  - OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).
- Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

Spill Response and Prevention

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.
- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.
- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

Other Considerations (Limitations and Regulations)

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.
- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.
- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:
  - Purchase and installation of signs.
  - Rental of vehicle(s) to haul illegally-disposed items and material to landfills.
  - Rental of heavy equipment to remove larger items (e.g., car bodies) from channels.
  - Purchase of landfill space to dispose of illegally-dumped items and material.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing resuspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm sewer flushing.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

Ferguson, B.K. 1991. Urban Stream Reclamation, p. 324-322, Journal of Soil and Water Conservation.

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

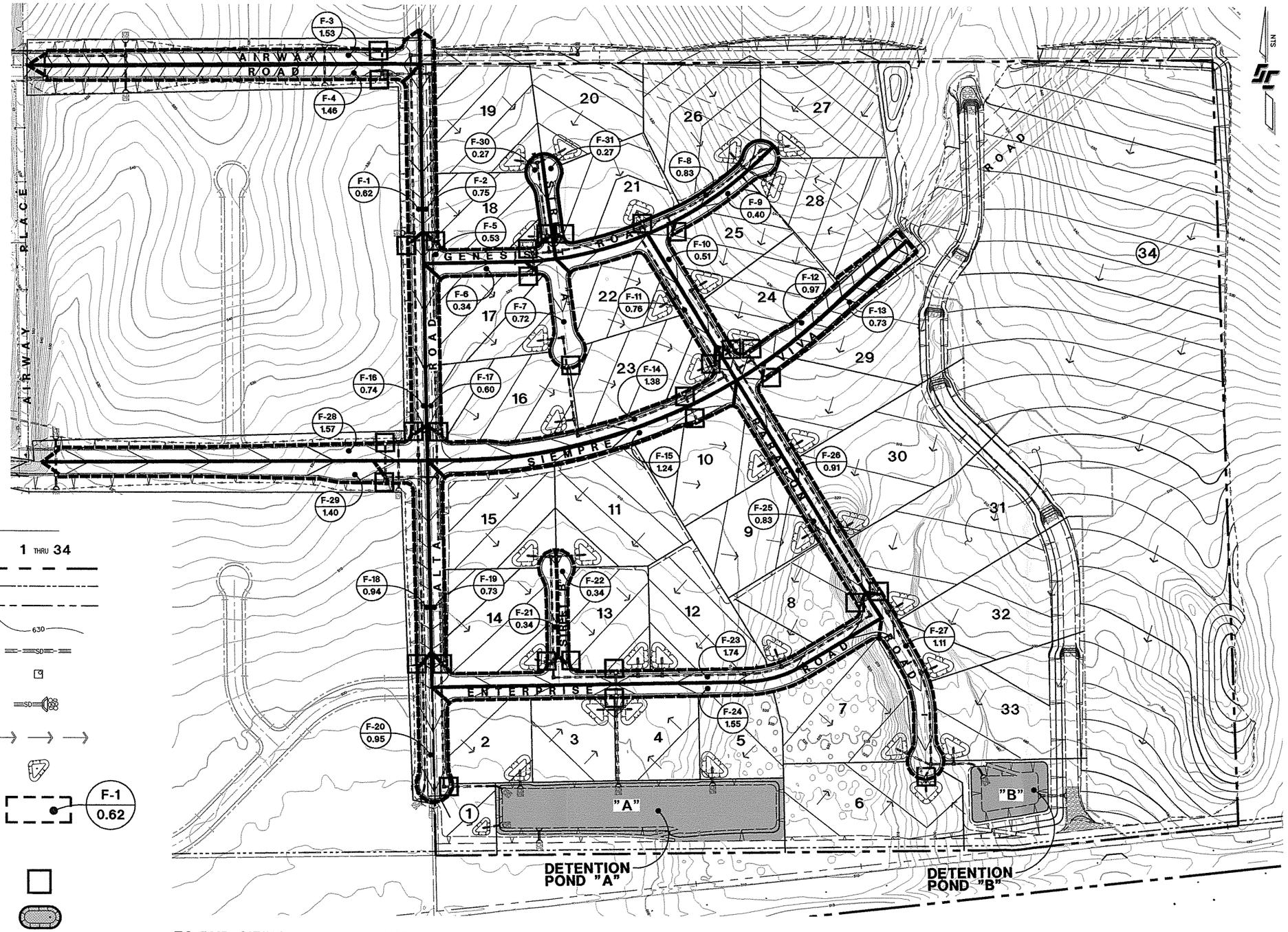
Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line:
http://www.epa.gov/npdes/menuofbmps/poll_16.htm

ATTACHMENT C

Drainage Management Area (DMA) Exhibit



LEGEND

PROPOSED LOT NUMBER	1 THRU 34
SUBDIVISION BOUNDARY	
PROPOSED LOT LINE	
PROPOSED RIGHT-OF-WAY	
PROPOSED CONTOUR	630
PROPOSED STORM DRAIN	SD
PROPOSED STORM DRAIN INLET	
PROPOSED STORM DRAIN HEADWALL/ ENERGY DISSIPATOR	SD
RUNOFF FLOW DIRECTION	
STORM WATER COLLECTION BASIN	
DRAINAGE MANAGEMENT AREA BOUNDARY AND LABEL	F-1 0.62

TC-BMPS:

CURB INLET FILTERS (BIO-CLEAN)

STORM WATER DETENTION BASIN (SIZED PER HYDROMODIFICATION/ PEAK FLOW MITIGATION CRITERIA, SEE ATTACHMENT H, AND DRAINAGE STUDY FOR ADDITIONAL DETAIL)

TC-BMP SIZING CALCULATIONS:

SEE ATTACHMENT D

HYDROLOGIC SOIL GROUP:

PER THE SAN DIEGO COUNTY HYDROLOGY MANUAL, HYDROLOGIC SOIL GROUPS MAP, THE SITE IS DOMINATED BY HYDROLOGIC SOIL GROUP D. GROUP D SOILS HAVE VERY SLOW INFILTRATION RATES WHEN THOROUGHLY WETTED. AS SUCH, INFILTRATION BMPS ARE NOT PROPOSED FOR USE AT THE SITE.

LID TREATMENT BMPS:

1) STORM WATER DETENTION WILL BE UTILIZED TO LIMIT POST-CONSTRUCTION PEAK RUNOFF RATES TO RATES NO GREATER THAN THOSE GENERATED BY THE PROJECT IN THE EXISTING CONDITION.

2) THOUGH THE PROPOSED PROJECT WILL EMPLOY LID SITE DESIGN PRINCIPALS TO THE MAXIMUM EXTENT PRACTICABLE (MEP), LID DESIGN OPTIONS ARE LIMITED AT THIS STAGE IN DEVELOPMENT SINCE THE PROJECT WILL ONLY CONSTRUCT STREETS AND ROUGH GRADED PADS. ULTIMATE LID SITE DESIGN STRATEGIES WILL BE IMPLEMENTED DURING THE DEVELOPMENT OF EACH LOT AND WILL BE DETERMINED DURING THE SITE PLAN REVIEW PERFORMED PRIOR TO THE DEVELOPMENT OF EACH LOT, AS MANDATED BY THE SPECIFIC PLAN.

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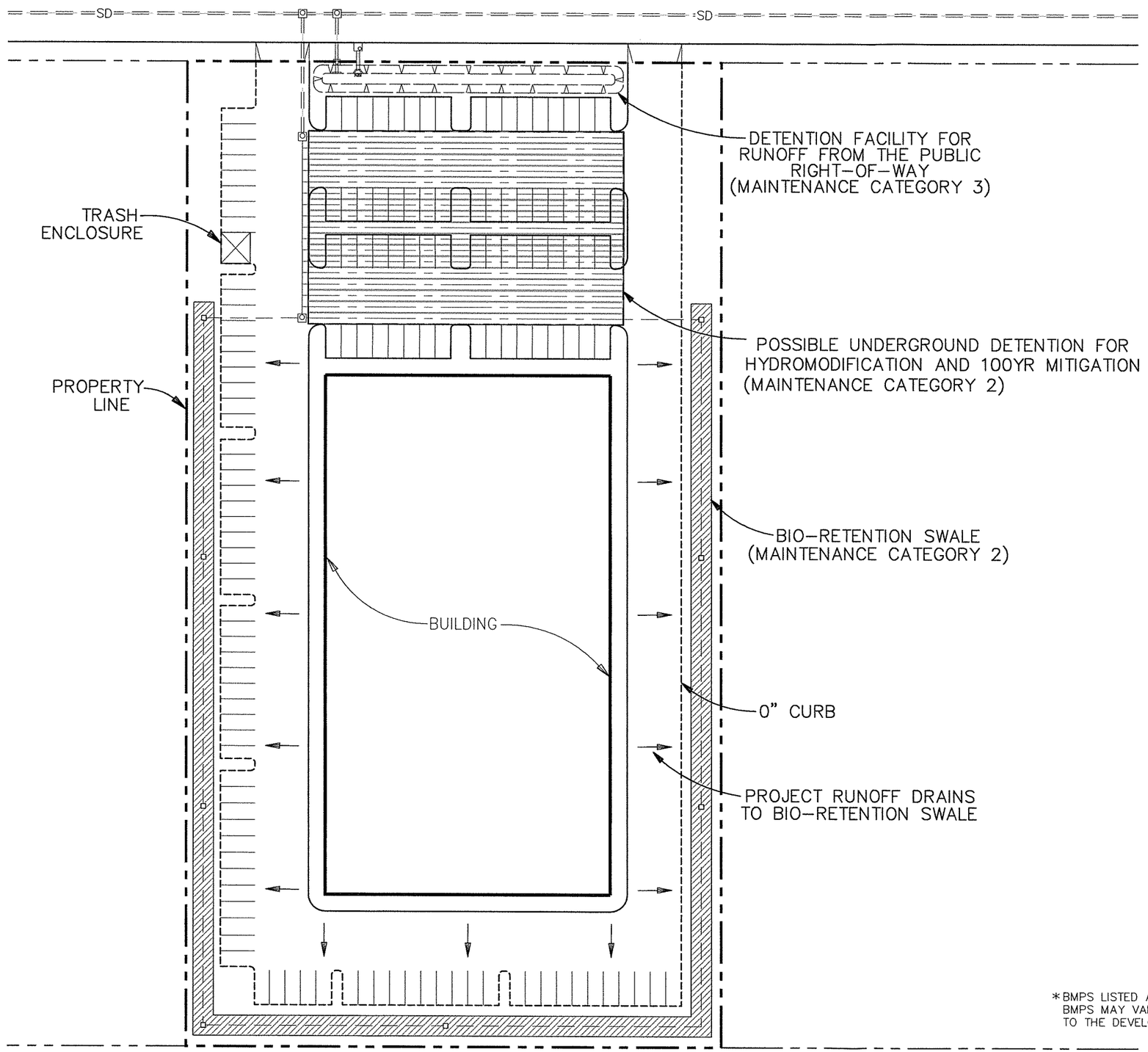
TRACT 5505R
SAN DIEGO, CALIFORNIA

ATTACHMENT "C-1"
STORM WATER MANAGEMENT PLAN
DRAINAGE MANAGEMENT AREA EXHIBIT

DATE:	01/31/14
SCE NO.	12009.02
SHEET	C-1
	1 OF 1 SHEET

TYPICAL ON-LOT LID BMPS



TYPICAL ON-LOT LID BMPS*:

1) MINIMIZE AND DISCONNECT IMPERVIOUS SURFACES
   - IT IS ANTICIPATED THAT THE FUTURE ON-LOT DEVELOPMENTS WILL BE APPROXIMATELY 80% IMPERVIOUS; 5-10% LESS THAN TYPICAL COMMERCIAL/ INDUSTRIAL DEVELOPMENTS.
   - IMPERVIOUS SURFACES WILL DRAIN TO LANDSCAPED AREAS.
2) DRAIN RUNOFF FROM IMPERVIOUS SURFACES TO PERVIOUS AREAS.
   - RUNOFF FROM PARKING LOTS, DRIVE LANES AND BUILDING ROOFTOPS WILL DRAIN TO BIO-RETENTIONS SWALES AROUND THE PROJECT PERIMETER.
   - RUNOFF FROM ADJACENT PUBLIC RIGHT-OF-WAYS MAY BE COLLECTED IN DETENTION FACILITIES CONSTRUCTED WITH THE PROJECT.
3) LID LANDSCAPING DESIGN
   - SOIL AMENDMENTS
   - REUSE OF NATIVE SOILS
   - STREET TREES

*BMPS LISTED ARE TYPICAL ON-LOT BMPS ANTICIPATED FOR USE AT THE PROJECT. ACTUAL BMPS MAY VARY AND WILL BE SPECIFIED DURING THE SITE PLAN REVIEW PERFORMED PRIOR TO THE DEVELOPMENT OF EACH LOT, AS MANDATED BY THE SPECIFIC PLAN.

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ATTACHMENT "C-2"
TYPICAL ON-LOT LID BMPS

DATE: 06/19/14
SCE NO. 12009.02
SHEET
C-2
1 OF 1 SHEET

ATTACHMENT D

Sizing Design Calculations and TC-BMP/LID Design Details

(Provide BMP Sizing Calculator results and/or continuous simulation modeling results, if applicable)

BMP Name: F-1	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-1	AC Pavement	1.0	0.62	0.62			
Total (AC)				0.62	0.20	0.12	2.1

BMP Name: F-2	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-2	AC Pavement	1.0	0.75	0.75			
Total (AC)				0.75	0.20	0.15	2.1

BMP Name: F-3	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-3	AC Pavement	1.0	1.53	1.53			
Total (AC)				1.53	0.20	0.31	2.1

BMP Name: F-4	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-4	AC Pavement	1.0	1.46	1.46			
Total (AC)				1.46	0.20	0.29	2.1

BMP Name: F-5	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-5	AC Pavement	1.0	0.53	0.53			
Total (AC)				0.53	0.20	0.11	2.1

BMP Name: F-6	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-6	AC Pavement	1.0	0.34	0.34			
Total (AC)				0.34	0.20	0.07	2.1

BMP Name: F-7	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-7	AC Pavement	1.0	0.72	0.72			
Total (AC)				0.72	0.20	0.14	2.1

BMP Name: F-8	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-8	AC Pavement	1.0	0.83	0.83			
Total (AC)				0.83	0.20	0.17	2.1

BMP Name: F-9	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-9	AC Pavement	1.0	0.40	0.40			
Total (AC)				0.40	0.20	0.08	2.1

BMP Name: F-10	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-10	AC Pavement	1.0	0.51	0.51			
Total (AC)				0.51	0.20	0.10	2.1

BMP Name: F-11	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-11	AC Pavement	1.0	0.76	0.76			
Total (AC)				0.76	0.20	0.15	2.1

SEE ATTACHMENT C FOR BMP LOCATIONS AND DMAs

BMP Name: F-12	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-12	AC Pavement	1.0	0.97	0.97			
Total (AC)				0.97	0.20	0.19	2.1

BMP Name: F-13	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-13	AC Pavement	1.0	0.73	0.73			
Total (AC)				0.73	0.20	0.15	2.1

BMP Name: F-14	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-14	AC Pavement	1.0	1.38	1.38			
Total (AC)				1.38	0.20	0.28	2.1

BMP Name: F-15	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-15	AC Pavement	1.0	1.24	1.24			
Total (AC)				1.24	0.20	0.25	2.1

BMP Name: F-16	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-16	AC Pavement	1.0	0.74	0.74			
Total (AC)				0.74	0.20	0.15	2.1

BMP Name: F-17	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-17	AC Pavement	1.0	0.60	0.60			
Total (AC)				0.60	0.20	0.12	2.1

BMP Name: F-18	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-18	AC Pavement	1.0	0.94	0.94			
Total (AC)				0.94	0.20	0.19	2.1

BMP Name: F-19	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-19	AC Pavement	1.0	0.73	0.73			
Total (AC)				0.73	0.20	0.15	2.1

BMP Name: F-20	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-20	AC Pavement	1.0	0.95	0.95			
Total (AC)				0.95	0.20	0.19	2.1

BMP Name: F-21	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-21	AC Pavement	1.0	0.34	0.34			
Total (AC)				0.34	0.20	0.07	2.1

BMP Name: F-22	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-22	AC Pavement	1.0	0.34	0.34			
Total (AC)				0.34	0.20	0.07	2.1

BMP Name: F-23	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-23	AC Pavement	1.0	1.74	1.74			
Total (AC)				1.74	0.20	0.35	2.1

BMP Name: F-24	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-24	AC Pavement	1.0	1.55	1.55			
Total (AC)				1.55	0.20	0.31	2.1

BMP Name: F-25	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-25	AC Pavement	1.0	0.83	0.83			
Total (AC)				0.83	0.20	0.17	2.1

BMP Name: F-26	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-26	AC Pavement	1.0	0.91	0.91			
Total (AC)				0.91	0.20	0.18	2.1

BMP Name: F-27	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-27	AC Pavement	1.0	1.11	1.11			
Total (AC)				1.11	0.20	0.22	2.1

BMP Name: F-28	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-28	AC Pavement	1.0	1.57	1.57			
Total (AC)				1.57	0.20	0.31	2.1

BMP Name: F-29	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-29	AC Pavement	1.0	1.40	1.40			
Total (AC)				1.40	0.20	0.28	2.1

BMP Name: F-30	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-30	AC Pavement	1.0	0.27	0.27			
Total (AC)				0.27	0.20	0.05	2.1

BMP Name: F-31	Soil Type: D						
Tributary DMAs							
DMA Name	Post-Project Surface Type	Runoff Factor	Area (AC)	Adjusted Area (AC)	Intensity (In/Hr)	Q_{WQ} (CFS)	BMP TREATMENT FLOW RATE (CFS)
F-31	AC Pavement	1.0	0.27	0.27			
Total (AC)				0.27	0.20	0.05	2.1

NOTE:
1) WATER QUALITY FLOW RATE IS CALCULATED BY MULTIPLYING THE ADJUSTED AREA BY THE WATER QUALITY INTENSITY (0.2 IN/HR)

2) A TREATMENT FLOW RATE OF 2.1 CFS IS PROVIDED BY THE FINE SCREEN MESH IN THE BOTTOM OF THE BIOCLEAN INLET FILTER.

3) INLET FILTERS PROVIDE SUPPLEMENTAL TREATMENT INTENDED PRIMARILY TO KEEP LARGE TRASH AND DEBRIS OUT OF THE STORM DRAIN SYSTEM. PRIMARY TREATMENT IS PROVIDED BY THE EXTENDED DETENTION BASINS. THE EXTENDED DETENTION BASINS ARE SIZED IN THE BMP SIZING CALCULATOR TO PROVIDE WATER QUALITY MITIGATION AND FLOW CONTROL, SEE ATTACHMENT H FOR DETAILS.

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OTAY BUSINESS PARK TRACT 5505R

SAN DIEGO, CALIFORNIA

ATTACHMENT "D" STORM WATER MANAGEMENT PLAN SIZING DESIGN CALCULATIONS

DATE: 01/31/14
SCE NO. 13007.01
SHEET D
1 OF 1 SHEET

Treatment Control BMPs

Otay Business Park proposes to construct public roads and rough graded pads. The rough graded pads will be stabilized with erosion and sediment control BMPs. The following TCBMPs will be implemented to provide water quality and hydromodification mitigation for runoff generated by the public roadways:

A. Curb Inlet Filter (Bio-Clean)
B. Regional Detention Basins (DB)

A. Curb Inlet Filter (Bio-Clean)

Storm drain inserts are a cost effective solution for treating storm water runoff prior to release to the public storm drain system. Table 11 - Groups of Pollutants and Relative Effectiveness of Treatment Facilities indicates that storm drain inserts provide low levels of pollutant removal for all pollutants except "coarse sediment and trash". Since runoff generated by the proposed roadways will be tributary to extended detention basins sized for treatment and hydromodification flow control, the inlet filters will only be relied upon to remove large debris that could impact the hydraulic function of the storm drain system. Curb inlet filters provide a high removal efficiency for this purpose.

Structural treatment BMPs to be implemented by Otay Business Park as a means to reduce pollution of storm water runoff due to the proposed development are:

Storm Drain inserts: Inserts will be located within curb inlets collecting runoff generated from public roadways.

Inserts treat "first flush" (Qff) minor storms and allow bypass of the filter for large storm events. Additionally, inserts remove hydrocarbons, oil, and petroleum products and assist in further removal of heavy metals which may escape non-structural good housekeeping practices, thus removing pollutants from public roadway runoff prior to release into the Municipal Storm Drain to the MEP.

- Design Criteria:
  a) Manufacturer's Specifications for the curb inlet inserts show a filtration capacity of 2.1 cfs for the fine mesh screen on the bottom of the High Capacity Basket.
  b) Based upon County of San Diego, Storm Water Standards, flow based BMPs are required to treat runoff from a storm with an intensity of 0.2 in/hr. Therefore these inserts can treat flows from tributary areas up to 11.1 acres (Qff= 2.1 cfs/(0.2in/hr)(0.95) = 11.1 Acres).
  c) Given that the maximum area tributary to a proposed curb inlet insert at Otay Business Park is approximately 1.6 acres, the project will have the ability to treat all public roadway runoff with excess capacity.

Manufacturer's Specifications are presented at the end of this section.

B. Regional Detention Basins (DB)

As required by the City of San Diego, "Drainage Requirements for Developments in Otay Mesa" (Memo dated: 08/07/1987), "...Each property owner shall provide storm water detention...so that the rate of runoff will not be greater after development than it was before development...." For Otay Business Park, storm water runoff will be conveyed to one of two regional detention basins; one in the southwest corner of the project, and one in the southeast corner. The basins will be sized to address water quality, hydromodification, and peak flow mitigation requirements; see Attachment H and the project Drainage Study for sizing calculations. Detaining the storm water will attenuate increased runoff due to development and assure that overall project release rates meet exiting levels. Detention, in itself, is a method to assure water quality by eliminating down stream impacts of increased runoff due to development. A conceptual schematic of a conventional above ground detention basin is shown in Figure A with a typical outlet structure shown in Figure B.

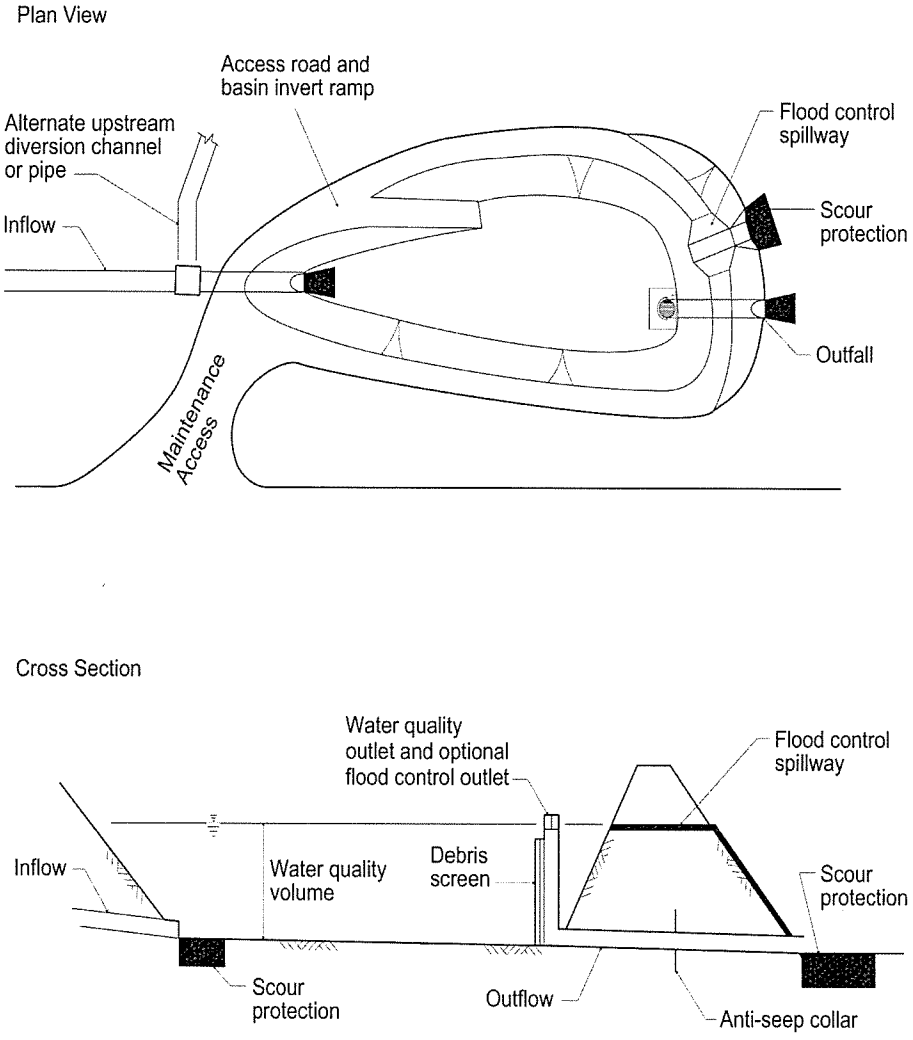
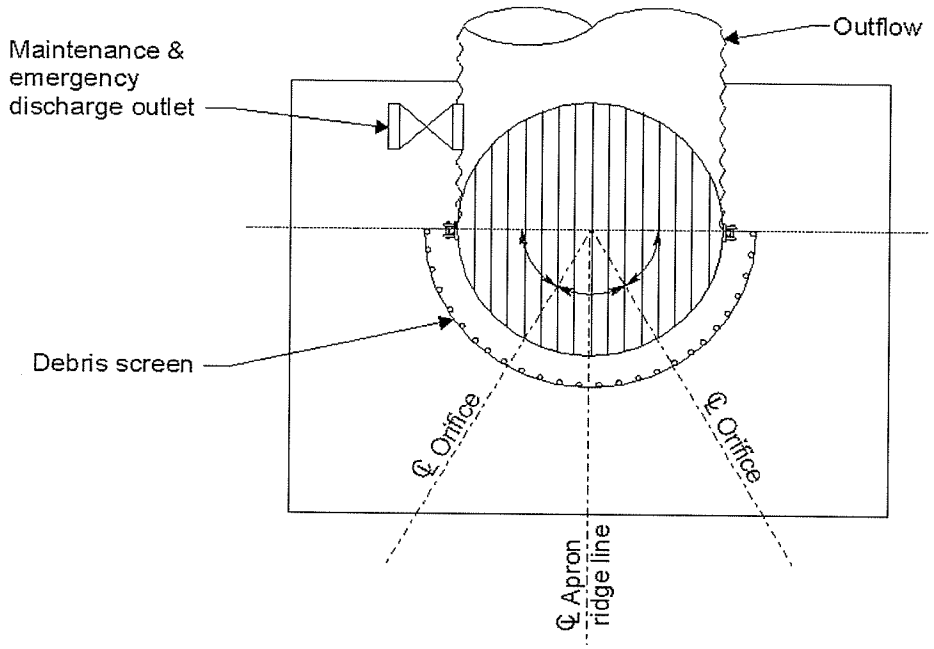


Figure A.
Schematic of Detention Basin
(Not a Standard Plan)

Plan



Profile

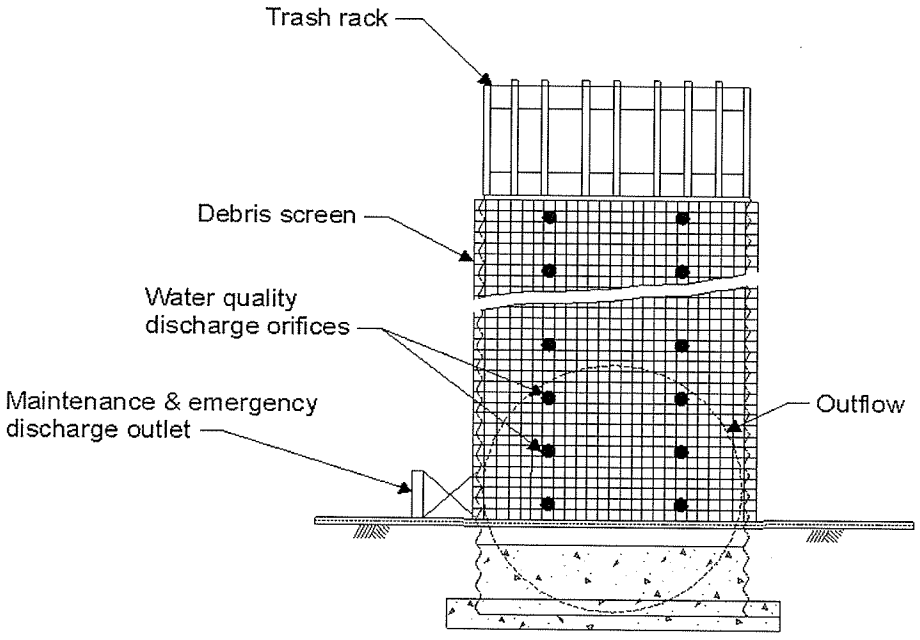


Figure B.
Detention Basin Outlet Structure Schematic
(Not a Standard Plan)

C. Vegetated Swale

Vegetated swales, designed per the SUSMP "Vegetated Swales" design criteria, will be incorporated into the project, where feasible, at final engineering. A typical section of a roadside swale is shown below in Figure C. All curb inlets will contain inlet filters and all road runoff will be tributary to an extended detention basin. As a result, vegetated swales will only provide supplemental treatment; no portion of the project will rely on them specifically for treatment.

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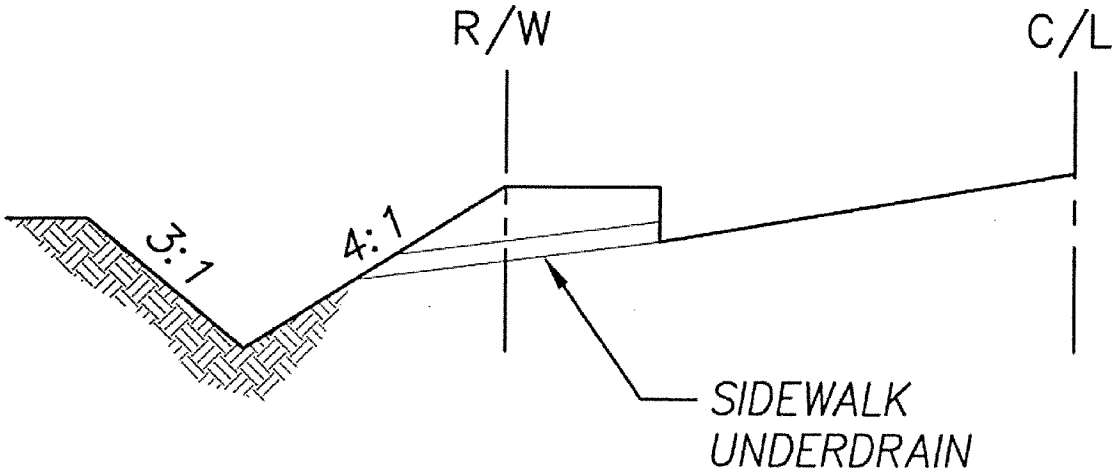
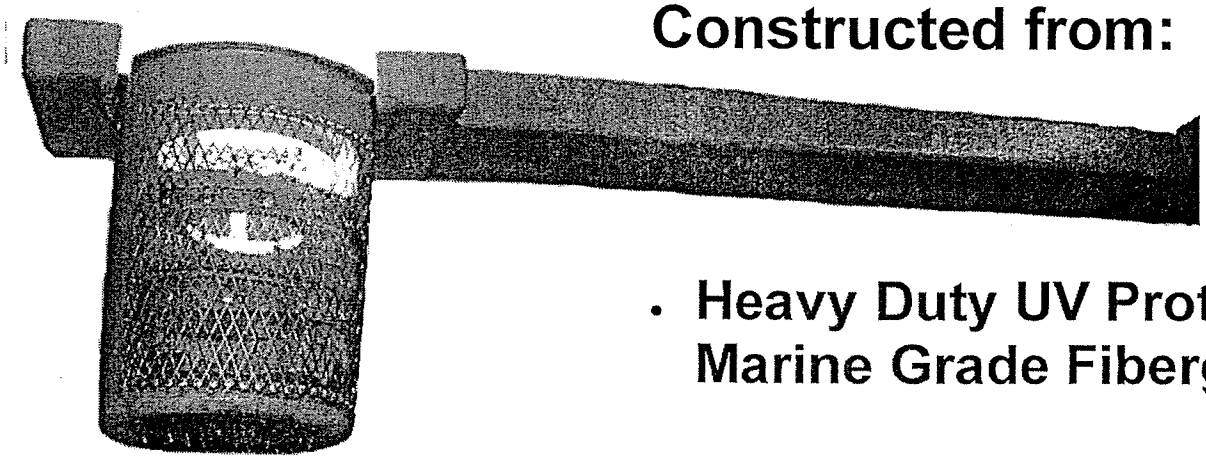


Figure C.
Vegetated Swale, Typical Section

High Capacity Basket

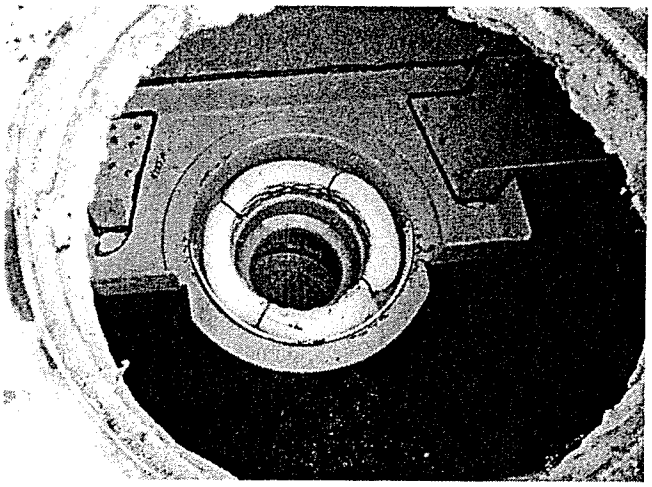
w/ Easy Maintenance Shelf System



Extreme Durability—
Constructed from:

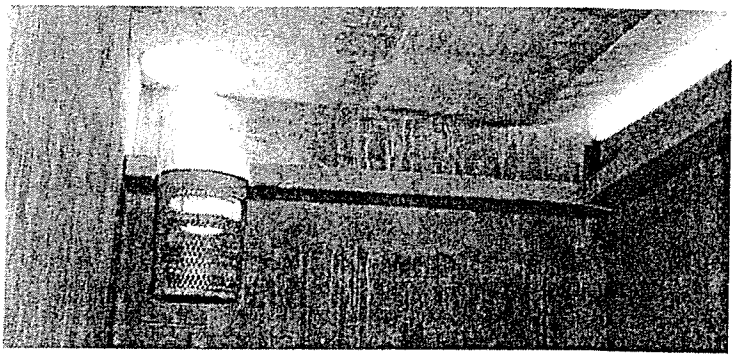
- Heavy Duty UV Protected Marine Grade Fiberglass
- High Grade Stainless Steel Hardware and Screens

5 Year
Unlimited Warranty on Construction



The Easiest Filter to Clean and Install

- Maintenance and Cleaning Crews Throughout Southern California Appreciate the User Friendly Design of Our Filters.



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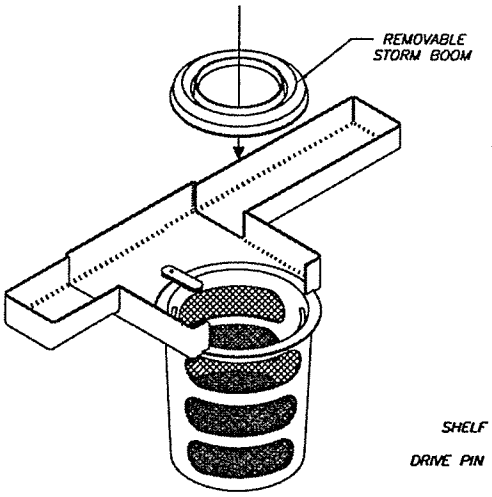
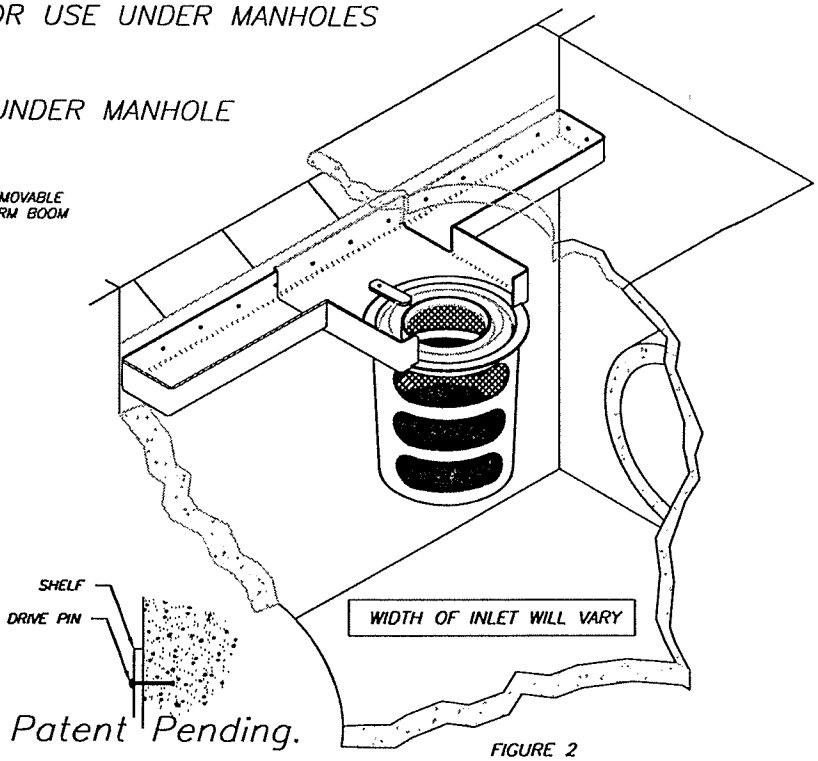
ENVIRO-SAFE HIGH CAPACITY ROUND GRATE INLET SKIMMER BOX SYSTEM FOR USE UNDER MANHOLES

ROUND GISB FOR MOUNTING UNDER MANHOLE



DETAIL OF PARTS
FIGURE 1



Patent Pending.

FIGURE 2
DETAIL OF INSTALLATION

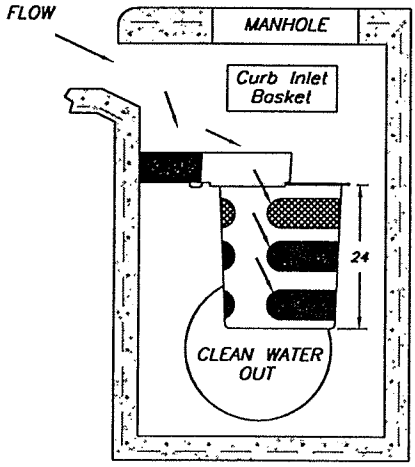


FIGURE 3
DETAIL OF PROCESS

FLOW RATES per Basket				
$Q=SO*c_d*A\sqrt{2*g*h}$ c_d = Coefficient of discharge = .67				
	SO	A(ft^2)	h (ft)	Q ($\frac{ft^3}{s}$)
TOP SIDE	1	135.22	5.50	3.42
CENTER SIDE	.62	130.36	11.5	2.95
BOTTOM SIDE	.56	125.50	17.50	3.17
BOTTOM	.68	63.14	20.81	2.11
TOTAL				11.65

NOTES:

1. SHELF SYSTEM PROVIDES FOR ENTIRE COVERAGE OF INLET OPENING SO TO DIVERT ALL FLOW TO BASKET.
2. SHELF SYSTEM MANUFACTURED FROM MARINE GRADE FIBERGLASS,GEL COATED FOR UV PROTECTION.
3. SHELF SYSTEM ATTACHED TO THE CATCH BASIN WITH NON-CORROSIVE HARDWARE.
4. FILTRATION BASKET STRUCTURE MANUFACTURED OF MARINE GRADE FIBERGLASS,GEL COATED FOR UV PROTECTION.
5. FILTRATION BASKET FINE SCREEN AND COARSE CONTAINMENT SCREEN MANUFACTURED FROM STAINLESS STEEL.
6. FILTRATION BASKET HOLDS BOOM OF ABSORBENT MEDIA TO CAPTURE HYDROCARBONS. BOOM IS EASILY REPLACED WITHOUT REMOVING MOUNTING HARDWARE.
7. FILTRATION BASKET LOCATION IS DIRECTLY UNDER MANHOLE FOR EASY MAINTENANCE.

REMOVABLE BASKET CATCHES EVERYTHING AND MAY BE REMOVED THROUGH MANHOLE WITHOUT ENTRY.

5 YEAR MANUFACTURERS WARRANTY

PATENTED

ALL FILTER SCREENS ARE STAINLESS STEEL

EXCLUSIVE CALIFORNIA DISTRIBUTOR:
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Email: info@bioclean environmental.net

SUNTREE QUALITY PRODUCTS ARE BUILT FOR EASY CLEANING AND ARE DESIGNED TO BE PERMANENT INFRASTRUCTURE AND SHOULD LAST FOR DECADES.

SUNTREE TECHNOLOGIES
798 CLEARLAKE RD. SUITE #2
COCOA FL. 32922
TEL. 321-637-7552 FAX 321-637-7554

CURB INLET BASKET SYSTEM

DATE: 04/12/04 | SCALE:SF = 15

DRAFTER: N.R.B. | UNITS = INCHES

PROJECT:	
REVISIONS:	DATE:
REVISIONS:	DATE:
REVISIONS:	DATE:
REVISIONS:	DATE:
REVISIONS:	DATE:

Bio-Sorb

Oil Absorbing Polymers

Our Bio-Sorb oil absorbing polymers are uniquely formulated to clean up...

- Spills
- Chemical Spills
- Fuel Oil Spills
- Diesel Oil Spills

Control and absorb oil and hydrocarbons on any surface – including water

- Control oil spills and slicks in harbor and dock areas
- Control oil contamination in municipal run-off
- Remove oil contamination from plant process water
- Clean-up fuel spills on highways
- Absorb hydrocarbon vapors and fumes

	TIME (seconds)	% Uptake	C
0	0.00	0.0200	
1	30.0	104.00	
2	60.0	107.00	
3	120	128.00	
4	180	155.00	
5	240	164.00	
6	300	188.00	

How Are Bio-Sorb Oil Absorbing Polymers Unique?

Bio-Sorb oil absorbing polymers function by first attracting hydrocarbons to the surface of the polymer to absorb the liquid, followed immediately by internally absorbing the media into its structure. Bio-Sorb oil absorbing polymers will not absorb water, which lends the material a unique usefulness for separating and collecting hydrocarbons from water mixtures. Most notably, the polymer can commonly absorb from 20% to 200% or more of its own weight of chemical or petroleum derived liquids. Furthermore, because of the unique absorption characteristic of the material, Bio-Sorb becomes dry to the touch shortly after sorption.

For What Applications May Biosorb Oil Absorbing Polymers be Useful?

Potential applications for Bio-Sorb hydrocarbon absorbing materials are numerous as a result of their unique nature. One can imagine applications for commercial, industrial, defense and ecological markets.

- Stormwater Filters
- Concentrate Carrier Material for Liquid Additives
- Removing Oil or Chemicals from Contaminated Water Streams or Water/Soil Slurries
- Industrial Work Area Collection Mats
- Spill Containment and Collection
- Odor Barrier/Collector for Flavor Oils and Fragrances
- Collection of Volatile Organic Compounds (VOC's)
- Many Others

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ENVIRONMENTAL SERVICES, INC.

P.O. BOX 889
OCEANSIDE, CA
www.bioceanenvironmental.net
PHONE: 760.433.7640
FAX: 760.433.3176

Grate Inlet Skimmer Box - Removal Efficiencies

Numeric Reductions (mg/L)

	Total Suspended Solids mg/L			Total Phosphorus mg/L			Total Nitrogen mg/L		
Location	Inlet	Outlet	Removal Efficiency	Inlet	Outlet	Removal Efficiency	Inlet	Outlet	Removal Efficiency
Site Evaluation - Reedy Creek			74%			57%	24.3	10.4	57%
Creech Engineering Report			73%			79%			79%
Witman's Pond	978	329	66%	18.6	0.452	98%	48.08	9.86	79%
UC Irvine			53%						

	Zinc mg/L			Lead mg/L			Copper mg/L		
Location	Inlet	Outlet	Removal Efficiency	Inlet	Outlet	Removal Efficiency	Inlet	Outlet	Removal Efficiency
UC Irvine			11%			99%			
Longo Toyota	13.7	0.73	95%	1.5	0.2	87%	1.9	0.1	95%

	Ammonia, Salicylate mg/L			Fecal Coliform CFU/100 mL			Cadmium		
Location	Inlet	Outlet	Removal Efficiency	Inlet	Outlet	Removal Efficiency	Inlet	Outlet	Removal Efficiency
Site Evaluation - Reedy Creek	0.38	0.23	39%						
UC Irvine						33%			94%

	Hydrocarbons mg/L			COD (mg/L)		
Location	Inlet	Outlet	Removal Efficiency	Inlet	Outlet	Removal Efficiency
Site Evaluation - Reedy Creek			54%	2670	1490	44%
Witman's Pond	110	50	66%			
UC Irvine			90%			
Longo Toyota	199	10.43	95%			

Reedy Creek - Site Evaluation of a Grate Inlet Skimmer Box for Debris, Sediment, and Oil & Grease Removal - 1998 - Independent Test
Creech Engineering Report - Pollutant Removal Testing for a Grate Inlet Skimmer Box - 2001
Witman's Pond - Restoration Project - Massachusetts Dept of Environmental Management - 1998 - Independent Test
UC Irvine - Optimization of Stormwater Filtration at the Urban/Watershed Interface - Dept of Environmental Health - 2005 - Independent Test
Longo Toyota - Field Test - City of El Monte - 2002 - Independent Test

POLLUTANT REMOVAL TESTING FOR A SUNTREE TECHNOLOGIES GRATE INLET SKIMMER BOX

Prepared for

Suntree Technologies, Inc.

November 2001

CEI Project #21121.00

Prepared By:

11-13-01

CRAIG ENGINEERS, INC.
CIVILIZATION ENGINEERED

4450 W. Eau Gallie Blvd., Ste. 232
Melbourne, FL 32934
(321) 255-5434

TABLE OF CONTENTS

Pollutant Removal Testing for a Suntree Technologies Grate Inlet Skimmer Box

by

Creech Engineers, Inc.

November 2001

With special thanks to Joanie Regan of the Cocoa Beach Stormwater Utility

Background:

Over the last several years, a number of BMPs have been developed to provide stormwater treatment by trapping pollutants and debris in inlets. Inlet trap BMPs are quasi source controls, being inexpensive, requiring no roadway construction or utility relocation, and keeping pollutants out of the water bodies, rather than trying to remove the pollutants from the water once it is contaminated. Suntree Technologies, of Cape Canaveral, Florida commissioned Creech Engineers, Inc. and Universal Engineering to perform testing on a Grate Inlet Skimmer Box (GISB) to determine its pollutant removal effectiveness for sediment and grass clippings. The testing was performed on September 26, 2001. Attached are photographs from the test and the accompanying report by Universal Engineering Sciences.

The GISB is designed to trap sediment, grass, leaves, organic debris, floating trash, and hydrocarbons as they enter a grated inlet, thereby preventing these pollutants from entering the stormdrain system where they would cause detrimental impacts on downstream waterbodies. The GISB is a 3/16" thick fiberglass device custom made to fit most types of grated inlets. The overflow capacity of the GISB is designed to be greater than the curb grate capacity, thereby insuring that there will be no loss of hydraulic capacity due to the device being inside the inlet. The bottom of the GISB is designed to be above any pipes entering or leaving the inlet so that flow through the inlet is not blocked.

Water flowing through the grate first encounters a hydrocarbon absorbing cellulose. This boom also serves to trap large debris between the boom and the body of the GISB. At the bottom of the trap are a series of stainless steel filter screens covering 3.5 inch wide cutouts in the fiberglass body. These screens trap debris while allowing water to pass through the bottom of the body and out to the storm drain system. The screens in the floor and first vertical row of the GISB are fine mesh. The second vertical row of screens are medium mesh and the highest row are coarse mesh. On the outside of the cutouts the screens are backed by stainless diamond plate to provide support to the screens since heavy loads of debris build up in the box. If the flow rate through the inlet exceeds the capacity of the filter screens there is another row of overflow holes cut out with no screens. These overflow holes allow water to pass through the GISB even if it becomes full of debris. The level of the holes is above the bottom of the top tray, enabling the tray to act as a skimmer to prevent floating trash from escaping through the overflow holes.

About halfway down the box is a diffuser plate to minimize resuspension of trapped sediment.

Inlet traps such as these are generally designed to capture hydrocarbons, sediment, and floating debris. There is generally a large build up of grass, leaves, and yard debris in the GISBs; which represent a source of nutrients, which do not enter the waterbodies. Royal and England, 1999, determined that leaves and grass leach most of their nutrients into the water within 24-72 hours after being submerged in water. GISBs are designed to keep captured debris in a dry state, off the bottom of the inlet, thus preventing phosphates and nitrates from leaching into the stormdrain system, where much more expensive BMPs would be required to remove the dissolved nutrients.

Methodology:

A test was designed to simulate a rainfall event and measure the ability of a GISB to remove sediment and grass leaves from a typical grated inlet at 600 South Brevard Ave., Cocoa Beach, Florida. Joanie Regan of the Cocoa Beach Stormwater Utility provided this location for the test, as well as a water truck to flush the curbs. Universal Engineering Sciences performed the testing, measurements, and sediment sampling. Creech Engineering, Inc. observed the testing.

The City has installed a number of these devices and Joanie indicated this location was typical of a normal installation. The grate, curb, and gutter around and upstream of the inlet were brushed and washed clean. A new, clean GISB was placed inside the inlet. A water truck with a pump discharged reuse water into the gutter upstream of the inlet at a rate of 500 gpm (1.1 cfs). Dry, green St. Augustine grass clippings from a yard that had been recently fertilized were slowly fed into the gutter and flushed into the inlet. It was observed that the cast iron grate trapped a significant amount of grass around the edges of the grate. The grate was removed for all tests to enable all of the grass and sediment to enter the box. After all of a measured sample of grass had been washed into the inlet, the grass was removed from the inlet, dried, and weighed. Samples of grass before and after the test were sent to PC&B Laboratories in Oviedo, Florida. Laboratory analysis was performed to determine the Total Phosphorus and TKN content of the grass.

Next, a sediment sample was washed through the GISB using the same methodology. Universal Engineering ran a sieve size analysis, using ASTM D 422 procedures, before and after the test. The sediment was classified as a poorly graded gravely sand. The sediment was removed from the GISB, dried, and weighed.

Results:

During both of the tests, all water leaving the GISB passed through the filter screens. The water levels in the box only rose a few inches, with no water passing through the overflow holes or coarse screens, even though the bottom screens were completely covered with grass or sediment. There was a small amount of grass and sediment that passed between the box and the concrete walls of the inlet because of the uneven edges of

the inlet. This situation is fairly common in most inlets due to loose tolerances in construction techniques.

In the grass test, 6.58 lbs. of grass were washed into the inlet and 5.22 lbs. were captured, resulting in 1.36 lbs. of grass passing through the GISB. This represents a removal efficiency of 79.3%. The pretest grass sample had a Total Phosphorus content of 950 mg/kg and a TKN content of 510 mg/kg. The grass sample removed from the GISB had a Total Phosphorus content of 2,270 mg/kg and TKN content of 905 mg/kg.

The sediment test was a little more complex. The initial results showed that of the 57.87 lbs. of sediment introduced to the GISB, 42.41 lbs. were captured, giving a total mass removal efficiency of 73.3%. Universal Engineering indicates that the Pretest sample had 10.7 % gravel, 88.0% sand, and 1.4% clay. The Post test sample had 25.9% gravel, 14.7% sand, and 1.7% clay. Gravel is considered to be particles No.4 and larger. Silt and clay is defined as particles passing the No. 200 sieve.

Table 1
Sediment Sieve Analysis

Sieve Size	3/8"	No. 4	No. 10	No. 40	No. 60	No. 100	No. 200
PreTest % Passing	94.3	89.3	81.8	64.8	50.3	25.5	1.4
Post Test % Passing	88.8	74.1	62.6	44.2	31.8	14.7	1.7
Difference	5.5	15.2	19.2	20.6	18.5	10.8	-0.3

Conclusions:

At the flow rate tested, the GISB removed 79.3% of the grass clippings washed into it. The ability of the GISB to remove grass during large flows when water passes through the bypass holes was not tested. In Florida, 90% of the storms are low rainfall events of 1" or less, resulting in low flows similar to the test conditions. This makes the GISB a very effective BMP for Low flow events. It is unknown how effectively the GISB works in large storm events.

By keeping grass and other trapped organic debris in a dry state, the nutrients in the debris do not leach out and become dissolved nitrates and phosphates. The GISB is a very effective BMP for preventing nutrients from organic debris from entering waterbodies. The significant increase in nutrient concentration after the test is probably attributed to the use of wastewater reuse water during the test. The grass matted several inches thick in the bottom of the box. This thick layer could have acted as a filter to remove nutrients from the water source.

At the flow rate of 1.1 cfs, the GISB had a sediment removal efficiency of 73.3%. As would be expected, most of the trapped sediment was gravel and sand, with little fine material collected. The GISB has sediment removal capabilities rivaling those found in many structural BMPs, at a fraction of the cost, and without disruptive construction.

Environmental Laboratories, Inc.

10926 Rush St., Suite A-168 • South El Monte, CA 91733 • Tel: (626) 575-5137 • Fax: (626) 575-7467

Client: CITY OF EL MONTE
PUBLIC WORKS/ENGINEERING DEPARTMENT
11333 Valley Boulevard
El Monte, CA 91731-3293

Report based on Analyses Results.

The city of El Monte provided ABN Environmental Laboratories, Inc. with four runoff samples which were collected from Longo Toyota. Only one sample was collected before filtration and three samples were collected after filtration. Three samples (after filtration) were collected on three separate dates. All four samples were tested for metals, oil & grease, and MBAS (soap)

Based on the analyses results, the following can be deduced:

The filtration is efficient in retaining the tested metals as well as oil & grease. However, filtration is unable to retain MBAS (soap) as indicated by the test results. This report is prepared based on limited runoff samples.

Respectfully submitted,

Fredrick Bet-Pera, Ph. D.
Laboratory Director

Jacob (Hacop) Nercessian
Technical Director

LAB TEST RESULTS-RUNOFF WATER SAMPLES
COLLECTED AT LONGO TOYOTA
BETWEEN 09/23/02 AND 11/07/02
(BIO CLEAN FILTERS)
TESTING BY ABN ENV. LABS., SOUTH EL MONTE, CA

No.	POLLUTANT	DETECTION LIMIT	TEST 1 NO FILTER	TEST 2 AFTER 1 WEEK W/FILTER	TEST 3 AFTER 3 WEEKS W/FILTER	TEST 4 AFTER 5 WEEKS W/FILTER
		mg/l	mg/l	mg/l	mg/l	mg/l
1	OIL & GREASE	2.70	199.00	< 2.7	20.00	8.60
2	SOAP	17.00	102.00	165.00	151.00	103.00
3	CHROMIUM	0.05	0.47	< 0.05	< 0.05	< 0.05
4	LEAD	0.10	1.50	0.40	< 0.10	< 0.10
5	COPPER	0.05	1.00	0.13	0.08	0.11
6	IRON	0.05	216.00	3.70	1.92	1.25
7	ALUMINUM	0.20	103.00	1.58	0.28	0.30
8	ZINC	0.10	16.70	1.10	0.34	0.76
9	NICKEL	0.10	0.70	0.30	< 0.10	0.15

(760) 433-7640 FAX (760) 433-3176
SALES λ SERVICE λ INFORMATION

The Efficiency of Storm Drain Filters in Removing Pollutants from Urban Road Runoff

Phase 3 and Final Report

March 2004

Prepared for:
The City and County of Honolulu
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615 Piikoi Street, #1605
Honolulu, Hawaii 96814

Overall Summary and Performance Evaluation Matrix

As part of the overall study, four neighborhoods with different land use within urban Honolulu were evaluated with respect to the conditions of streets and roadways with emphasis on material that might enter the storm drain system during storm and/or "nuisance" runoff. The quantity and quality of RDS, the abundance of oil and grease on the pavement and of gross litter near and adjoining storm drain inlets/catch basins were determined through a series of surveys. Conditions on land adjoining the surveyed storm drain inlets as well as traffic density were also examined. Not surprisingly, it was found that the quality of RDS deteriorates from neighborhoods that are comprised primarily of single-family homes with yards (e.g., upper Manoa) through high-density multi-family areas (e.g., Makiki) to commercial/light industrial (e.g., Kakaako). On average RDS from Kakaako displayed the highest heavy metal concentrations. The abundance of RDS, however, does not seem to depend on land use, as RDS was found to be abundant near almost all the storm drain inlets examined throughout the four neighborhoods. This finding is consistent with observations by the C&CH Roads Division who, according to DES staff, state that street sweepers always come back full, regardless of how long it has been between episodes of street sweeping. Clearly street sweeping is a beneficial practice, as it removes RDS that is most readily transported into the storm drain system and can contribute to heavy metal pollution in sediments of receiving waters. Street sweeping also targets other materials such as vegetative debris that can also contribute to degraded water quality (i.e., high BOD) in receiving waters, not to mention potentially clog the storm drain system.

Vegetative debris was generally found to be more abundant in residential neighborhoods than in commercial/light industrial areas. Certain streets, however, are particularly prone to the accumulation of vegetative debris, largely as a function of the abundance of trees lining the particular city streets.

Abundances of gross litter and rubbish vary considerably within any given neighborhood. There does not seem to be a strong correlation between land use and the abundance of gross rubbish, although greater amounts of rubbish are often observed in the immediate proximity of small businesses, particularly fast-food establishments, "mini-marts" or convenience stores.

This study also researched the commercially available DI devices that can readily be retrofitted into existing catch basins. Many systems exist, although many challenges exist

including but not limited to costs (both initial and maintenance), the need for modifications to the catch basin, and size constraints, which limit the pool of devices that are potentially suitable for large-scale implementation. A variety of large systems that require specific construction were also identified but not deemed appropriate for this study. Four DII systems were subsequently selected from those deemed potentially suitable for large-scale retrofit installations and their performance was evaluated through short- and long-term field studies.

The performance of the four DII systems that were field-tested varied considerably. Each system has characteristics that provide advantages in terms of target pollutants. Each system also exhibits considerable differences in terms of initial costs of the DII installation as well as maintenance/servicing costs. The latter typically depend on replacement costs of filter media (e.g., Kristar, Bioclean, and Hydrocompliance systems) or entire devices (e.g., Abtech system) as well as the cost of manpower required for maintenance/servicing. Because there are about 21,000 catch basins within Honolulu, the overall efficiency of any given system in pollutant removal may not necessarily be the most important evaluation criterion. Additionally, of the 21,000 catch basins in Honolulu, possibly 30-50% are Type B catch basins. The Type B catch basins pose different challenges to DII installation as well as maintenance. Only the Bioclean and Kristar systems appear to be readily suitable for use in Type B catch basins.

Examination of total RDS and PAH removal data shows that the Hydrocompliance and Kristar systems performed best in the long term experiments; the Abtech and Bioclean systems, however, performed best for oil and grease. With respect to gross litter (rubbish), the size of the baskets or compartments of the DII largely dictates their efficacy. Therefore, the Bioclean and Kristar DII systems appeared better than either the Abtech or Hydrocompliance systems in this category. Finally, when including cost factors, the Bioclean and the Kristar DII systems appear to perform best in the long-term evaluations.

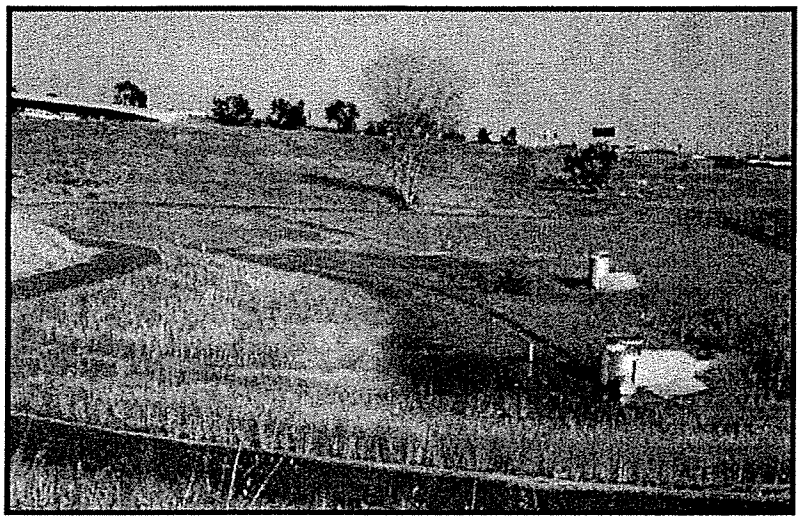
All the above factors must be considered before any final decision as to what system to utilize for BMP implementation can be made. With hopes of facilitating such a decision, a matrix was constructed to evaluate each system with the tested DII assigned a ranking in various categories. Ranking were then normalized to a value of 10. Because of the importance of fiscal constraints in any potential large-scale BMP implementation, the categories for initial cost and filter media (or device) replacement costs were scaled to 20. Similarly, because of personnel/costs constraints, the "service requirements" category was assigned a maximum score

of 25 points. The maximum possible score for each DII system using the above matrix evaluation was 185 points. The matrix, which is somewhat subjective with respect to the importance placed on the various parameters, is provided below. Scores for the Bioclean (142) and Kristar (127.5) systems are relatively similar but substantially higher than those for the Abtech (110.5) and Hydrocompliance (91.5) systems.

Performance matrix for field tested DII systems				
Parameter	**AbTech**	**Hydrocompliance**	**KriStar**	**Bioclean**
Initial device cost (10 ft drain inlet)	10	5	15	20
Initial installation requirements	10	2.5	7.5	5
Flow capacity	5	10	2.5	7.5
Turbidity during short term test	5	10	7.5	2.5
Short term RDS retention	10	5	7.5	2.5
Short term organics retention	10	2.5	7.5	5
Long term RDS retention	2.5	10	7.5	5
Long term PAH retention (mg)	5	10	7.5	5
Long term O/G retained (mg)	10	5	2.5	7.5
Long term overall rubbish retention	5	5	10	10
Suitability for Vector Control	5	2.5	7.5	10
Unit durability	7.5	2.5	7.5	10
Media replacement Costs	5	10	15	20
Suitability for Type B basin	2.5	2.5	7.5	10
Servicing Requirements	18	9	15	22
TOTAL SCORE	**110.5**	**91.5**	**127.5**	142

Performance of DII is ranked from one to four, with increasing scores assigned to increasing performance of the device. Ranks for each category are scaled to 10 except initial costs and media replacement costs which are scaled to 20. Servicing requirements are based on a score of 25 as determined in Appendix A. Maximum total possible score is 185.

Extended Detention Basin TC-22



Design Considerations

- Tributary Area
- Area Required
- Hydraulic Head

Description

Dry extended detention ponds (a.k.a. dry ponds, extended detention basins, detention ponds, extended detention ponds) are basins whose outlets have been designed to detain the stormwater runoff from a water quality design storm for some minimum time (e.g., 48 hours) to allow particles and associated pollutants to settle. Unlike wet ponds, these facilities do not have a large permanent pool. They can also be used to provide flood control by including additional flood detention storage.

Targeted Constituents

☑	Sediment	▲
☑	Nutrients	●
☑	Trash	■
☑	Metals	▲
☑	Bacteria	▲
☑	Oil and Grease	▲
☑	Organics	▲

Legend *(Removal Effectiveness)*

● Low ■ High

▲ Medium

California Experience

Caltrans constructed and monitored 5 extended detention basins in southern California with design drain times of 72 hours. Four of the basins were earthen, less costly and had substantially better load reduction because of infiltration that occurred, than the concrete basin. The Caltrans study reaffirmed the flexibility and performance of this conventional technology. The small headloss and few siting constraints suggest that these devices are one of the most applicable technologies for stormwater treatment.

Advantages

- Due to the simplicity of design, extended detention basins are relatively easy and inexpensive to construct and operate.
- Extended detention basins can provide substantial capture of sediment and the toxics fraction associated with particulates.
- Widespread application with sufficient capture volume can provide significant control of channel erosion and enlargement caused by changes to flow frequency

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relationships resulting from the increase of impervious cover in a watershed.

Limitations

- Limitation of the diameter of the orifice may not allow use of extended detention in watersheds of less than 5 acres (would require an orifice with a diameter of less than 0.5 inches that would be prone to clogging).
- Dry extended detention ponds have only moderate pollutant removal when compared to some other structural stormwater practices, and they are relatively ineffective at removing soluble pollutants.
- Although wet ponds can increase property values, dry ponds can actually detract from the value of a home due to the adverse aesthetics of dry, bare areas and inlet and outlet structures.

Design and Sizing Guidelines

- Capture volume determined by local requirements or sized to treat 85% of the annual runoff volume.
- Outlet designed to discharge the capture volume over a period of hours.
- Length to width ratio of at least 1.5:1 where feasible.
- Basin depths optimally range from 2 to 5 feet.
- Include energy dissipation in the inlet design to reduce resuspension of accumulated sediment.
- A maintenance ramp and perimeter access should be included in the design to facilitate access to the basin for maintenance activities and for vector surveillance and control.
- Use a draw down time of 48 hours in most areas of California. Draw down times in excess of 48 hours may result in vector breeding, and should be used only after coordination with local vector control authorities. Draw down times of less than 48 hours should be limited to BMP drainage areas with coarse soils that readily settle and to watersheds where warming may be determined to downstream fisheries.

Construction/Inspection Considerations

- Inspect facility after first large to storm to determine whether the desired residence time has been achieved.
- When constructed with small tributary area, orifice sizing is critical and inspection should verify that flow through additional openings such as bolt holes does not occur.

Performance

One objective of stormwater management practices can be to reduce the flood hazard associated with large storm events by reducing the peak flow associated with these storms. Dry extended detention basins can easily be designed for flood control, and this is actually the primary purpose of most detention ponds.

Dry extended detention basins provide moderate pollutant removal, provided that the recommended design features are incorporated. Although they can be effective at removing some pollutants through settling, they are less effective at removing soluble pollutants because of the absence of a permanent pool. Several studies are available on the effectiveness of dry extended detention ponds including one recently concluded by Caltrans (2002).

The load reduction is greater than the concentration reduction because of the substantial infiltration that occurs. Although the infiltration of stormwater is clearly beneficial to surface receiving waters, there is the potential for groundwater contamination. Previous research on the effects of incidental infiltration on groundwater quality indicated that the risk of contamination is minimal.

There were substantial differences in the amount of infiltration that were observed in the earthen basins during the Caltrans study. On average, approximately 40 percent of the runoff entering the unlined basins infiltrated and was not discharged. The percentage ranged from a high of about 60 percent to a low of only about 8 percent for the different facilities. Climatic conditions and local water table elevation are likely the principal causes of this difference. The least infiltration occurred at a site located on the coast where humidity is higher and the basin invert is within a few meters of sea level. Conversely, the most infiltration occurred at a facility located well inland in Los Angeles County where the climate is much warmer and the humidity is less, resulting in lower soil moisture content in the basin floor at the beginning of storms.

Vegetated detention basins appear to have greater pollutant removal than concrete basins. In the Caltrans study, the concrete basin exported sediment and associated pollutants during a number of storms. Export was not as common in the earthen basins, where the vegetation appeared to help stabilize the retained sediment.

Siting Criteria

Dry extended detention ponds are among the most widely applicable stormwater management practices and are especially useful in retrofit situations where their low hydraulic head requirements allow them to be sited within the constraints of the existing storm drain system. In addition, many communities have detention basins designed for flood control. It is possible to modify these facilities to incorporate features that provide water quality treatment and/or channel protection. Although dry extended detention ponds can be applied rather broadly, designers need to ensure that they are feasible at the site in question. This section provides basic guidelines for siting dry extended detention ponds.

In general, dry extended detention ponds should be used on sites with a minimum area of 5 acres. With this size catchment area, the orifice size can be on the order of 0.5 inches. On smaller sites, it can be challenging to provide channel or water quality control because the orifice diameter at the outlet needed to control relatively small storms becomes very small and thus prone to clogging. In addition, it is generally more cost-effective to control larger drainage areas due to the economies of scale.

Extended detention basins can be used with almost all soils and geology, with minor design adjustments for regions of rapidly percolating soils such as sand. In these areas, extended detention ponds may need an impermeable liner to prevent ground water contamination.

The base of the extended detention facility should not intersect the water table. A permanently wet bottom may become a mosquito breeding ground. Research in Southwest Florida (Santana et al., 1994) demonstrated that intermittently flooded systems, such as dry extended detention ponds, produce more mosquitoes than other pond systems, particularly when the facilities remained wet for more than 3 days following heavy rainfall.

A study in Prince George's County, Maryland, found that stormwater management practices can increase stream temperatures (Galli, 1990). Overall, dry extended detention ponds increased temperature by about 5°F. In cold water streams, dry ponds should be designed to detain stormwater for a relatively short time (i.e., 24 hours) to minimize the amount of warming that occurs in the basin.

Additional Design Guidelines

In order to enhance the effectiveness of extended detention basins, the dimensions of the basin must be sized appropriately. Merely providing the required storage volume will not ensure maximum constituent removal. By effectively configuring the basin, the designer will create a long flow path, promote the establishment of low velocities, and avoid having stagnant areas of the basin. To promote settling and to attain an appealing environment, the design of the basin should consider the length to width ratio, cross-sectional areas, basin slopes and pond configuration, and aesthetics (Young et al., 1996).

Energy dissipation structures should be included for the basin inlet to prevent resuspension of accumulated sediment. The use of stilling basins for this purpose should be avoided because the standing water provides a breeding area for mosquitoes.

Extended detention facilities should be sized to completely capture the water quality volume. A micropool is often recommended for inclusion in the design and one is shown in the schematic diagram. These small permanent pools greatly increase the potential for mosquito breeding and complicate maintenance activities; consequently, they are not recommended for use in California.

A large aspect ratio may improve the performance of detention basins; consequently, the outlets should be placed to maximize the flowpath through the facility. The ratio of flowpath length to width from the inlet to the outlet should be at least 1.5:1 (L:W) where feasible. Basin depths optimally range from 2 to 5 feet.

The facility's drawdown time should be regulated by an orifice or weir. In general, the outflow structure should have a trash rack or other acceptable means of preventing clogging at the entrance to the outflow pipes. The outlet design implemented by Caltrans in the facilities constructed in San Diego County used an outlet riser with orifices

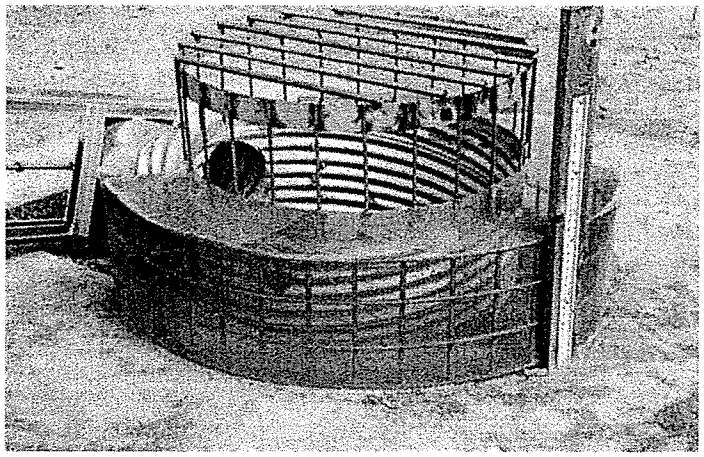

Figure 1
Example of Extended Detention Outlet Structure

sized to discharge the water quality volume, and the riser overflow height was set to the design storm elevation. A stainless steel screen was placed around the outlet riser to ensure that the orifices would not become clogged with debris. Sites either used a separate riser or broad crested weir for overflow of runoff for the 25 and greater year storms. A picture of a typical outlet is presented in Figure 1.

The outflow structure should be sized to allow for complete drawdown of the water quality volume in 72 hours. No more than 50% of the water quality volume should drain from the facility within the first 24 hours. The outflow structure can be fitted with a valve so that discharge from the basin can be halted in case of an accidental spill in the watershed.

Summary of Design Recommendations

(1) Facility Sizing - The required water quality volume is determined by local regulations or the basin should be sized to capture and treat 85% of the annual runoff volume. See Section 5.5.1 of the handbook for a discussion of volume-based design.

Basin Configuration – A high aspect ratio may improve the performance of detention basins; consequently, the outlets should be placed to maximize the flowpath through the facility. The ratio of flowpath length to width from the inlet to the outlet should be at least 1.5:1 (L:W). The flowpath length is defined as the distance from the inlet to the outlet as measured at the surface. The width is defined as the mean width of the basin. Basin depths optimally range from 2 to 5 feet. The basin may include a sediment forebay to provide the opportunity for larger particles to settle out.

A micropool should not be incorporated in the design because of vector concerns. For online facilities, the principal and emergency spillways must be sized to provide 1.0 foot of freeboard during the 25-year event and to safely pass the flow from 100-year storm.

(2) Pond Side Slopes - Side slopes of the pond should be 3:1 (H:V) or flatter for grass stabilized slopes. Slopes steeper than 3:1 (H:V) must be stabilized with an appropriate slope stabilization practice.

(3) Basin Lining – Basins must be constructed to prevent possible contamination of groundwater below the facility.

(4) Basin Inlet – Energy dissipation is required at the basin inlet to reduce resuspension of accumulated sediment and to reduce the tendency for short-circuiting.

(5) Outflow Structure - The facility's drawdown time should be regulated by a gate valve or orifice plate. In general, the outflow structure should have a trash rack or other acceptable means of preventing clogging at the entrance to the outflow pipes.

The outflow structure should be sized to allow for complete drawdown of the water quality volume in 72 hours. No more than 50% of the water quality volume should drain from the facility within the first 24 hours. The outflow structure should be fitted with a valve so that discharge from the basin can be halted in case of an accidental spill in the watershed. This same valve also can be used to regulate the rate of discharge from the basin.

The discharge through a control orifice is calculated from:

$$Q = CA(2g(H-H_o))^{0.5}$$

where: Q = discharge (ft^3/s)
C = orifice coefficient
A = area of the orifice (ft^2)
g = gravitational constant (32.2)
H = water surface elevation (ft)
H_o= orifice elevation (ft)

Recommended values for C are 0.66 for thin materials and 0.80 when the material is thicker than the orifice diameter. This equation can be implemented in spreadsheet form with the pond stage/volume relationship to calculate drain time. To do this, use the initial height of the water above the orifice for the water quality volume. Calculate the discharge and assume that it remains constant for approximately 10 minutes. Based on that discharge, estimate the total discharge during that interval and the new elevation based on the stage volume relationship. Continue to iterate until H is approximately equal to H_o. When using multiple orifices the discharge from each is summed.

(6) Splitter Box - When the pond is designed as an offline facility, a splitter structure is used to isolate the water quality volume. The splitter box, or other flow diverting approach, should be designed to convey the 25-year storm event while providing at least 1.0 foot of freeboard along pond side slopes.

(7) Erosion Protection at the Outfall - For online facilities, special consideration should be given to the facility's outfall location. Flared pipe end sections that discharge at or near the stream invert are preferred. The channel immediately below the pond outfall should be modified to conform to natural dimensions, and lined with large stone riprap placed over filter cloth. Energy dissipation may be required to reduce flow velocities from the primary spillway to non-erosive velocities.

(8) Safety Considerations - Safety is provided either by fencing of the facility or by managing the contours of the pond to eliminate dropoffs and other hazards. Earthen side slopes should not exceed 3:1 (H:V) and should terminate on a flat safety bench area. Landscaping can be used to impede access to the facility. The primary spillway opening must not permit access by small children. Outfall pipes above 48 inches in diameter should be fenced.

Maintenance

Routine maintenance activity is often thought to consist mostly of sediment and trash and debris removal; however, these activities often constitute only a small fraction of the maintenance hours. During a recent study by Caltrans, 72 hours of maintenance was performed annually, but only a little over 7 hours was spent on sediment and trash removal. The largest recurring activity was vegetation management, routine mowing. The largest absolute number of hours was associated with vector control because of mosquito breeding that occurred in the stilling basins (example of standing water to be avoided) installed as energy dissipaters. In most cases, basic housekeeping practices such as removal of debris accumulations and vegetation

management to ensure that the basin dewaters completely in 48-72 hours is sufficient to prevent creating mosquito and other vector habitats.

Consequently, maintenance costs should be estimated based primarily on the mowing frequency and the time required. Mowing should be done at least annually to avoid establishment of woody vegetation, but may need to be performed much more frequently if aesthetics are an important consideration.

Typical activities and frequencies include:

- Schedule semiannual inspection for the beginning and end of the wet season for standing water, slope stability, sediment accumulation, trash and debris, and presence of burrows.
- Remove accumulated trash and debris in the basin and around the riser pipe during the semiannual inspections. The frequency of this activity may be altered to meet specific site conditions.
- Trim vegetation at the beginning and end of the wet season and inspect monthly to prevent establishment of woody vegetation and for aesthetic and vector reasons.
- Remove accumulated sediment and re-grade about every 10 years or when the accumulated sediment volume exceeds 10 percent of the basin volume. Inspect the basin each year for accumulated sediment volume.

Cost

Construction Cost

The construction costs associated with extended detention basins vary considerably. One recent study evaluated the cost of all pond systems (Brown and Schueler, 1997). Adjusting for inflation, the cost of dry extended detention ponds can be estimated with the equation:

$$C = 12.4V^{0.760}$$

where: C = Construction, design, and permitting cost, and
V = Volume (ft^3).

Using this equation, typical construction costs are:

$ 41,600 for a 1 acre-foot pond

$ 239,000 for a 10 acre-foot pond

$ 1,380,000 for a 100 acre-foot pond

Interestingly, these costs are generally slightly higher than the predicted cost of wet ponds (according to Brown and Schueler, 1997) on a cost per total volume basis, which highlights the difficulty of developing reasonably accurate construction estimates. In addition, a typical facility constructed by Caltrans cost about $160,000 with a capture volume of only 0.3 ac-ft.

An economic concern associated with dry ponds is that they might detract slightly from the value of adjacent properties. One study found that dry ponds can actually detract from the

perceived value of homes adjacent to a dry pond by between 3 and 10 percent (Emmerling-Dinovo, 1995).

Maintenance Cost

For ponds, the annual cost of routine maintenance is typically estimated at about 3 to 5 percent of the construction cost (EPA website). Alternatively, a community can estimate the cost of the maintenance activities outlined in the maintenance section. Table 1 presents the maintenance costs estimated by Caltrans based on their experience with five basins located in southern California. Again, it should be emphasized that the vast majority of hours are related to vegetation management (mowing).

Table 1 Estimated Average Annual Maintenance Effort

Activity	Labor Hours	Equipment & Material ($)	Cost
Inspections	4	7	183
Maintenance	49	126	2282
Vector Control	0	0	0
Administration	3	0	132
Materials	-	535	535
Total	**56**	**$668**	**$3,132**

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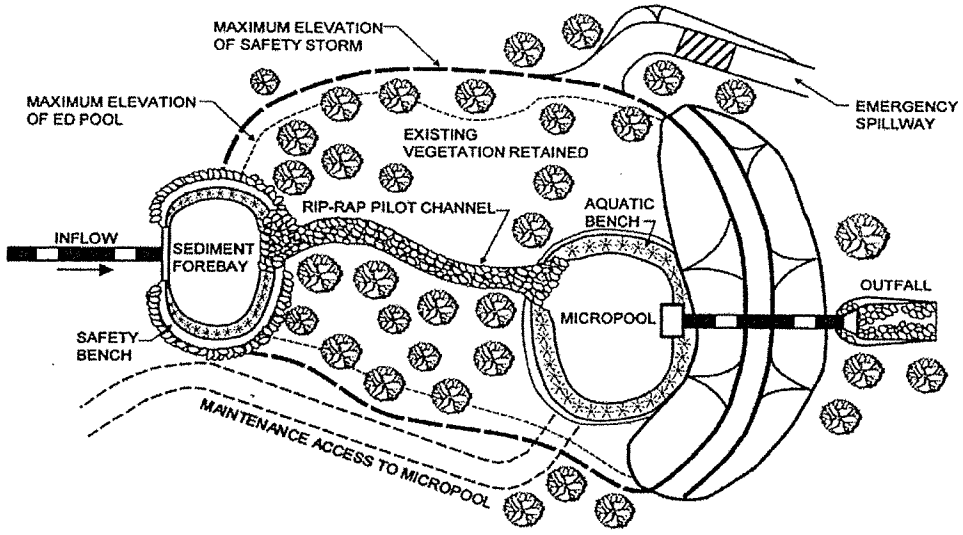
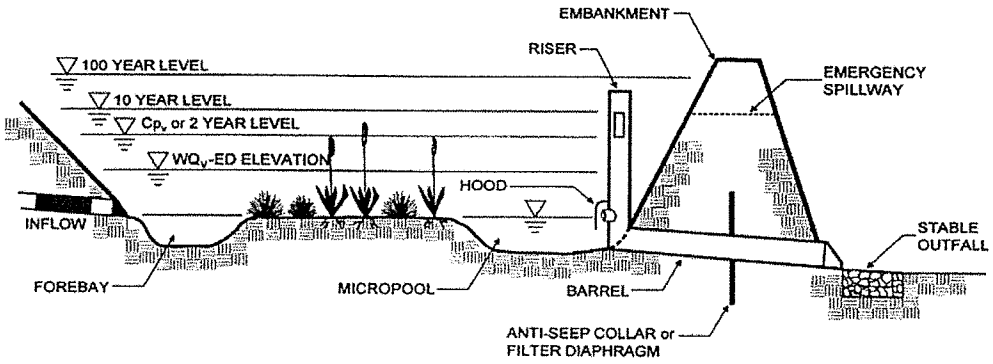


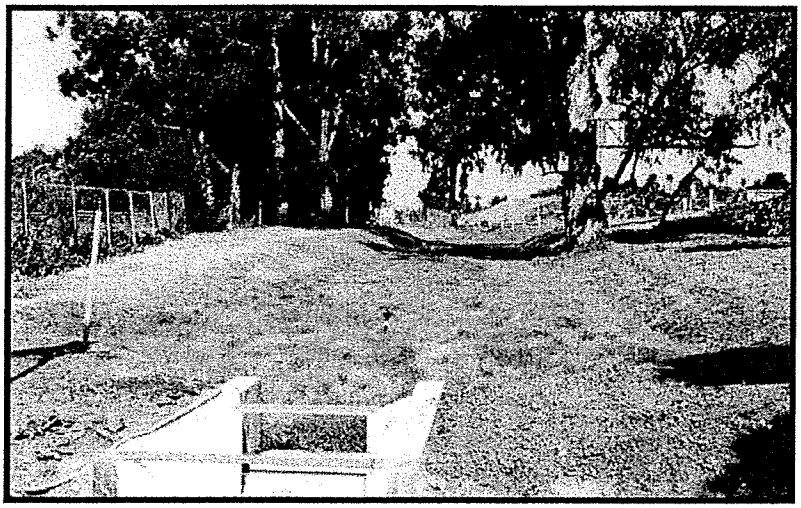
PLAN VIEW



PROFILE

Schematic of an Extended Detention Basin (MDE, 2000)

Vegetated Swale TC-30



Design Considerations

- Tributary Area
- Area Required
- Slope
- Water Availability

Description

Vegetated swales are open, shallow channels with vegetation covering the side slopes and bottom that collect and slowly convey runoff flow to downstream discharge points. They are designed to treat runoff through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Swales can be natural or manmade. They trap particulate pollutants (suspended solids and trace metals), promote infiltration, and reduce the flow velocity of stormwater runoff. Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems.

Targeted Constituents

☑	Sediment	▲
☑	Nutrients	●
☑	Trash	●
☑	Metals	▲
☑	Bacteria	●
☑	Oil and Grease	▲
☑	Organics	▲

Legend *(Removal Effectiveness)*

● Low ■ High

▲ Medium

California Experience

Caltrans constructed and monitored six vegetated swales in southern California. These swales were generally effective in reducing the volume and mass of pollutants in runoff. Even in the areas where the annual rainfall was only about 10 inches/yr, the vegetation did not require additional irrigation. One factor that strongly affected performance was the presence of large numbers of gophers at most of the sites. The gophers created earthen mounds, destroyed vegetation, and generally reduced the effectiveness of the controls for TSS reduction.

Advantages

- If properly designed, vegetated, and operated, swales can serve as an aesthetic, potentially inexpensive urban development or roadway drainage conveyance measure with significant collateral water quality benefits.

- Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible.

Limitations

- Can be difficult to avoid channelization.
- May not be appropriate for industrial sites or locations where spills may occur
- Grassed swales cannot treat a very large drainage area. Large areas may be divided and treated using multiple swales.
- A thick vegetative cover is needed for these practices to function properly.
- They are impractical in areas with steep topography.
- They are not effective and may even erode when flow velocities are high, if the grass cover is not properly maintained.
- In some places, their use is restricted by law: many local municipalities require curb and gutter systems in residential areas.
- Swales are mores susceptible to failure if not properly maintained than other treatment BMPs.

Design and Sizing Guidelines

- Flow rate based design determined by local requirements or sized so that 85% of the annual runoff volume is discharged at less than the design rainfall intensity.
- Swale should be designed so that the water level does not exceed 2/3rds the height of the grass or 4 inches, which ever is less, at the design treatment rate.
- Longitudinal slopes should not exceed 2.5%
- Trapezoidal channels are normally recommended but other configurations, such as parabolic, can also provide substantial water quality improvement and may be easier to mow than designs with sharp breaks in slope.
- Swales constructed in cut are preferred, or in fill areas that are far enough from an adjacent slope to minimize the potential for gopher damage. Do not use side slopes constructed of fill, which are prone to structural damage by gophers and other burrowing animals.
- A diverse selection of low growing, plants that thrive under the specific site, climatic, and watering conditions should be specified. Vegetation whose growing season corresponds to the wet season are preferred. Drought tolerant vegetation should be considered especially for swales that are not part of a regularly irrigated landscaped area.
- The width of the swale should be determined using Manning's Equation using a value of 0.25 for Manning's n.

Construction/Inspection Considerations

- Include directions in the specifications for use of appropriate fertilizer and soil amendments based on soil properties determined through testing and compared to the needs of the vegetation requirements.
- Install swales at the time of the year when there is a reasonable chance of successful establishment without irrigation; however, it is recognized that rainfall in a given year may not be sufficient and temporary irrigation may be used.
- If sod tiles must be used, they should be placed so that there are no gaps between the tiles; stagger the ends of the tiles to prevent the formation of channels along the swale or strip.
- Use a roller on the sod to ensure that no air pockets form between the sod and the soil.
- Where seeds are used, erosion controls will be necessary to protect seeds for at least 75 days after the first rainfall of the season.

Performance

The literature suggests that vegetated swales represent a practical and potentially effective technique for controlling urban runoff quality. While limited quantitative performance data exists for vegetated swales, it is known that check dams, slight slopes, permeable soils, dense grass cover, increased contact time, and small storm events all contribute to successful pollutant removal by the swale system. Factors decreasing the effectiveness of swales include compacted soils, short runoff contact time, large storm events, frozen ground, short grass heights, steep slopes, and high runoff velocities and discharge rates.

Conventional vegetated swale designs have achieved mixed results in removing particulate pollutants. A study performed by the Nationwide Urban Runoff Program (NURP) monitored three grass swales in the Washington, D.C., area and found no significant improvement in urban runoff quality for the pollutants analyzed. However, the weak performance of these swales was attributed to the high flow velocities in the swales, soil compaction, steep slopes, and short grass height.

Another project in Durham, NC, monitored the performance of a carefully designed artificial swale that received runoff from a commercial parking lot. The project tracked 11 storms and concluded that particulate concentrations of heavy metals (Cu, Pb, Zn, and Cd) were reduced by approximately 50 percent. However, the swale proved largely ineffective for removing soluble nutrients.

The effectiveness of vegetated swales can be enhanced by adding check dams at approximately 17 meter (50 foot) increments along their length (See Figure 1). These dams maximize the retention time within the swale, decrease flow velocities, and promote particulate settling. Finally, the incorporation of vegetated filter strips parallel to the top of the channel banks can help to treat sheet flows entering the swale.

Only 9 studies have been conducted on all grassed channels designed for water quality (Table 1). The data suggest relatively high removal rates for some pollutants, but negative removals for some bacteria, and fair performance for phosphorus.

Table 1 Grassed swale pollutant removal efficiency data

	Removal Efficiencies (% Removal)						
Study	TSS	TP	TN	NO_3	Metals	Bacteria	Type
Caltrans 2002	77	8	67	66	83-90	-33	dry swales
Goldberg 1993	67.8	4.5	-	31.4	42–62	-100	grassed channel
Seattle Metro and Washington Department of Ecology 1992	60	45	-	-25	2–16	-25	grassed channel
Seattle Metro and Washington Department of Ecology, 1992	83	29	-	-25	46–73	-25	grassed channel
Wang et al., 1981	80	-	-	-	70–80	-	dry swale
Dorman et al., 1989	98	18	-	45	37–81	-	dry swale
Harper, 1988	87	83	84	80	88–90	-	dry swale
Kercher et al., 1983	99	99	99	99	99	-	dry swale
Harper, 1988.	81	17	40	52	37–69	-	wet swale
Koon, 1995	67	39	-	9	-35 to 6	-	wet swale

While it is difficult to distinguish between different designs based on the small amount of available data, grassed channels generally have poorer removal rates than wet and dry swales, although some swales appear to export soluble phosphorus (Harper, 1988; Koon, 1995). It is not clear why swales export bacteria. One explanation is that bacteria thrive in the warm swale soils.

Siting Criteria

The suitability of a swale at a site will depend on land use, size of the area serviced, soil type, slope, imperviousness of the contributing watershed, and dimensions and slope of the swale system (Schueler et al., 1992). In general, swales can be used to serve areas of less than 10 acres, with slopes no greater than 5 %. Use of natural topographic lows is encouraged and natural drainage courses should be regarded as significant local resources to be kept in use (Young et al., 1996).

Selection Criteria (NCTCOG, 1993)

- Comparable performance to wet basins
- Limited to treating a few acres
- Availability of water during dry periods to maintain vegetation
- Sufficient available land area

Research in the Austin area indicates that vegetated controls are effective at removing pollutants even when dormant. Therefore, irrigation is not required to maintain growth during dry periods, but may be necessary only to prevent the vegetation from dying.

The topography of the site should permit the design of a channel with appropriate slope and cross-sectional area. Site topography may also dictate a need for additional structural controls. Recommendations for longitudinal slopes range between 2 and 6 percent. Flatter slopes can be used, if sufficient to provide adequate conveyance. Steep slopes increase flow velocity, decrease detention time, and may require energy dissipating and grade check. Steep slopes also can be managed using a series of check dams to terrace the swale and reduce the slope to within acceptable limits. The use of check dams with swales also promotes infiltration.

Additional Design Guidelines

Most of the design guidelines adopted for swale design specify a minimum hydraulic residence time of 9 minutes. This criterion is based on the results of a single study conducted in Seattle, Washington (Seattle Metro and Washington Department of Ecology, 1992), and is not well supported. Analysis of the data collected in that study indicates that pollutant removal at a residence time of 5 minutes was not significantly different, although there is more variability in that data. Therefore, additional research in the design criteria for swales is needed. Substantial pollutant removal has also been observed for vegetated controls designed solely for conveyance (Barrett et al, 1998); consequently, some flexibility in the design is warranted.

Many design guidelines recommend that grass be frequently mowed to maintain dense coverage near the ground surface. Recent research (Colwell et al., 2000) has shown mowing frequency or grass height has little or no effect on pollutant removal.

Summary of Design Recommendations

1) The swale should have a length that provides a minimum hydraulic residence time of at least 10 minutes. The maximum bottom width should not exceed 10 feet unless a dividing berm is provided. The depth of flow should not exceed 2/3rds the height of the grass at the peak of the water quality design storm intensity. The channel slope should not exceed 2.5%.

2) A design grass height of 6 inches is recommended.

3) Regardless of the recommended detention time, the swale should be not less than 100 feet in length.

4) The width of the swale should be determined using Manning's Equation, at the peak of the design storm, using a Manning's n of 0.25.

5) The swale can be sized as both a treatment facility for the design storm and as a conveyance system to pass the peak hydraulic flows of the 100-year storm if it is located "on-line." The side slopes should be no steeper than 3:1 (H:V).

6) Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible. If flow is to be introduced through curb cuts, place pavement slightly above the elevation of the vegetated areas. Curb cuts should be at least 12 inches wide to prevent clogging.

7) Swales must be vegetated in order to provide adequate treatment of runoff. It is important to maximize water contact with vegetation and the soil surface. For general purposes, select fine, close-growing, water-resistant grasses. If possible, divert runoff (other than necessary irrigation) during the period of vegetation

establishment. Where runoff diversion is not possible, cover graded and seeded areas with suitable erosion control materials.

Maintenance

The useful life of a vegetated swale system is directly proportional to its maintenance frequency. If properly designed and regularly maintained, vegetated swales can last indefinitely. The maintenance objectives for vegetated swale systems include keeping up the hydraulic and removal efficiency of the channel and maintaining a dense, healthy grass cover.

Maintenance activities should include periodic mowing (with grass never cut shorter than the design flow depth), weed control, watering during drought conditions, reseeding of bare areas, and clearing of debris and blockages. Cuttings should be removed from the channel and disposed in a local composting facility. Accumulated sediment should also be removed manually to avoid concentrated flows in the swale. The application of fertilizers and pesticides should be minimal.

Another aspect of a good maintenance plan is repairing damaged areas within a channel. For example, if the channel develops ruts or holes, it should be repaired utilizing a suitable soil that is properly tamped and seeded. The grass cover should be thick; if it is not, reseed as necessary. Any standing water removed during the maintenance operation must be disposed to a sanitary sewer at an approved discharge location. Residuals (e.g., silt, grass cuttings) must be disposed in accordance with local or State requirements. Maintenance of grassed swales mostly involves maintenance of the grass or wetland plant cover. Typical maintenance activities are summarized below:

- Inspect swales at least twice annually for erosion, damage to vegetation, and sediment and debris accumulation preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the swale is ready for winter. However, additional inspection after periods of heavy runoff is desirable. The swale should be checked for debris and litter, and areas of sediment accumulation.
- Grass height and mowing frequency may not have a large impact on pollutant removal. Consequently, mowing may only be necessary once or twice a year for safety or aesthetics or to suppress weeds and woody vegetation.
- Trash tends to accumulate in swale areas, particularly along highways. The need for litter removal is determined through periodic inspection, but litter should always be removed prior to mowing.
- Sediment accumulating near culverts and in channels should be removed when it builds up to 75 mm (3 in.) at any spot, or covers vegetation.
- Regularly inspect swales for pools of standing water. Swales can become a nuisance due to mosquito breeding in standing water if obstructions develop (e.g. debris accumulation, invasive vegetation) and/or if proper drainage slopes are not implemented and maintained.

Cost

Construction Cost

Little data is available to estimate the difference in cost between various swale designs. One study (SWRPC, 1991) estimated the construction cost of grassed channels at approximately $0.25 per ft^2. This price does not include design costs or contingencies. Brown and Schueler (1997) estimate these costs at approximately 32 percent of construction costs for most stormwater management practices. For swales, however, these costs would probably be significantly higher since the construction costs are so low compared with other practices. A more realistic estimate would be a total cost of approximately $0.50 per ft^2, which compares favorably with other stormwater management practices.

Table 2 Swale Cost Estimate (SEWRPC, 1991)

Component	Unit	Extent	Unit Cost			Total Cost		
			Low	Moderate	High	Low	Moderate	High
Mobilization / Demobilization-Light	Swale	1	$107	$274	$441	$107	$274	$441
Site Preparation								
Clearing[b]	Acre	0.5	$2,200	$3,800	$5,400	$1,100	$1,900	$2,700
Grubbing[c]	Acre	0.25	$3,800	$5,200	$6,600	$950	$1,300	$1,650
General Excavation[d]	Yd^3	372	$2.10	$3.70	$5.30	$781	$1,376	$1,972
Level and Till[e]	Yd^2	1,210	$0.20	$0.35	$0.50	$242	$424	$605
Sites Development								
Salvaged Topsoil Seed, and Mulch[f]	Yd^2	1,210	$0.40	$1.00	$1.60	$484	$1,210	$1,936
Sod[g]	Yd^2	1,210	$1.20	$2.40	$3.60	$1,452	$2,904	$4,356
Subtotal	--	--	--	--	--	$5,116	$9,388	$13,660
Contingencies	Swale	1	25%	25%	25%	$1,279	$2,347	$3,415
Total	--	--	--	--	--	$6,395	$11,735	$17,075

Source: (SEWRPC, 1991)

Note: Mobilization/demobilization refers to the organization and planning involved in establishing a vegetative swale.

[a] Swale has a bottom width of 1.0 foot, a top width of 10 feet with 1:3 side slopes, and a 1,000-foot length.

[b] Area cleared = (top width + 10 feet) x swale length.

[c] Area grubbed = (top width x swale length).

[d] Volume excavated = (0.67 x top width x swale depth) x swale length (parabolic cross-section).

[e] Area tilled = $\left(\text{top width} + \frac{8(\text{swale depth}^2)}{3(\text{top width})}\right) \times$ swale length (parabolic cross-section).

[f] Area seeded = area cleared x 0.5.

[g] Area sodded = area cleared x 0.5.

Table 3 Estimated Maintenance Costs (SEWRPC, 1991)

Component	Unit Cost	Swale Size (Depth and Top Width)		Comment
		1.5 Foot Depth, One-Foot Bottom Width, 10-Foot Top Width	3-Foot Depth, 3-Foot Bottom Width, 21-Foot Top Width	
Lawn Mowing	$0.85 / 1,000 ft²/ mowing	$0.14 / linear foot	$0.21 / linear foot	Lawn maintenance area=(top width + 10 feet) x length. Mow eight times per year
General Lawn Care	$9.00 / 1,000 ft²/ year	$0.18 / linear foot	$0.28 / linear foot	Lawn maintenance area = (top width + 10 feet) x length
Swale Debris and Litter Removal	$0.10 / linear foot / year	$0.10 / linear foot	$0.10 / linear foot	–
Grass Reseeding with Mulch and Fertilizer	$0.30 / yd²	$0.01 / linear foot	$0.01 / linear foot	Area revegetated equals 1% of lawn maintenance area per year
Program Administration and Swale Inspection	$0.15 / linear foot / year, plus $25 / inspection	$0.15 / linear foot	$0.15 / linear foot	Inspect four times per year
Total	--	**$0.58 / linear foot**	**$ 0.75 / linear foot**	--

Maintenance Cost

Caltrans (2002) estimated the expected annual maintenance cost for a swale with a tributary area of approximately 2 ha at approximately $2,700. Since almost all maintenance consists of mowing, the cost is fundamentally a function of the mowing frequency. Unit costs developed by SEWRPC are shown in Table 3. In many cases vegetated channels would be used to convey runoff and would require periodic mowing as well, so there may be little additional cost for the water quality component. Since essentially all the activities are related to vegetation management, no special training is required for maintenance personnel.

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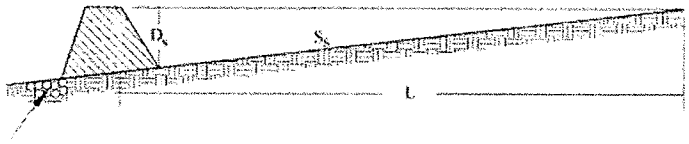
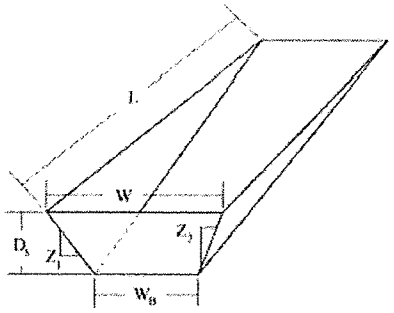


Provide for scour protection.

(a) Cross section of swale with check dam.



(b) Dimensional view of swale impoundment area.

Notation:

L = Length of swale impoundment area per check dam (ft)
D_S = Depth of check dam (ft)
S_S = Bottom slpe of swale (ft/ft)
W = Top width of check dam (ft)
W_B = Bottom width of check dam (ft)
$Z_{1&2}$ = Ratio of horizontal to vertical change in swale side slope (ft/ft)

ATTACHMENT E

Geotechnical Certification Sheet

(if applicable)

The design of stormwater treatment and other control measures proposed in this plan requiring specific soil infiltration characteristics and/or geological conditions has been reviewed and approved by a registered Civil Engineer, Geotechnical Engineer, or Geologist in the State of California.

_____ _____

Name and registration # Date

N/A – no infiltration BMPs proposed.

ATTACHMENT F

Maintenance Plan

(Use Chapter 5 of the SUSMP as guidance in developing your Maintenance Plan)

Otay Business Park proposes to construct public roads and rough graded pads. The rough graded pads will be stabilized with sediment and erosion control BMPs and are intended to require little to no maintenance upon establishment of the hydroseed. TC-BMPs proposed to provide water quality and hydromodification mitigation for runoff generated by the public roadways are curb inlet filters and extended detention basins. These BMPs will be maintained per Category 2 criteria for an interim period and will ultimately be maintained per Category 3 and 4 maintenance criteria. The County of San Diego will assume responsibility for maintenance of the curb inlet filters, and a Storm Water Maintenance Assessment District will be established to maintain the extended detention basins. In the interim, a Storm Water Maintenance Agreement with Easements and Covenants, prepared at final engineering, will be entered into by the owner and the County of San Diego, obliging the owner to maintain the facilities into perpetuity. Responsibility for maintenance of the facilities will transfer with ownership of the property, until such time that the county or maintenance district assumes responsibility.

The Maintenance Plan developed at final engineering will contain general maintenance guidelines, an inspection form, and an exhibit showing the location of the maintenance items. Preliminary maintenance guidelines are provided here for future use.

GENERAL MAINTENANCE GUIDELINES

A. CURB INLET FILTER (BIO-CLEAN)

The operational and maintenance needs of a Bio-Clean Curb Inlet Filter are:

- Removal of accumulated materials with a vacuum truck
- Replacement of adsorbent boom
- Inspection of the unit to ensure that it is functioning properly

Inspection Frequency
Each unit will be inspected and inspection visits will be completely documented:

- After every runoff event for the first 90 days
- Once every 60 days during the rainfall season
- At the end of the rainfall season

After the first year, inspection frequencies may be modified based on pollutant accumulation and the specific maintenance needs of each unit. The manufacture will provide inspection criteria during installation. A typical inspection program is identified below.

Functional Maintenance
Functional maintenance has two components:

1. Preventive maintenance
2. Corrective maintenance

Maintenance requirements are specific to the manufacturer. The manufacture will provide maintenance criteria during installation. A typical maintenance program is identified below.

Preventive Maintenance
Preventive maintenance activities to be instituted for debris separation are:

- **Trash and Debris Removal.** Trash and Debris accumulation, as part of the operation and maintenance program of the Bio-Clean filter, will be monitored after every large storm event, and cleaned out at least twice per year.
- **Sediment Removal.** Sediment accumulation, as part of the operation and maintenance program of the Bio-Clean filter, will be monitored after every large storm event, and cleaned out at least twice per year.
- **Hydrocarbon Boom Replacement.** Replace hydrocarbon boom per manufacturer's criteria.

Corrective Maintenance
Corrective maintenance is required on an emergency or non-routine basis to correct problems and to restore the intended operation and safe function of a Bio-Clean filter. Corrective maintenance activities include:

- **Removal of Debris and Sediment.** Sediment, debris, and trash, which impede the functioning of a Bio-Clean filter will be removed and properly disposed.
- **Replacement.** Once deemed necessary. Qualified individuals (i.e., the manufacturer representatives) will conduct replacement if damage has occurred.

Maintenance Frequency
Maintenance frequency is site dependant and at final engineering the manufacturer should be contacted for initial schedule and details. Maintenance activities will be performed per the manufacturer's requirements attached at the end of this section. Contact: BIO CLEAN ENVIRONMENTAL SERVICES, Incorporated at 760-433-7640.

Debris and Sediment Disposal
Any debris or sediment found in a Bio-Clean filter shall be disposed of offsite in accordance with local, State and Federal regulations.

The following is a list of approved disposal sites:

Non-Hazardous Waste
Miramar Landfill 619-573-1418
5180 Convoy Street
San Diego, CA

Hazardous Waste (i.e., Gas, Oil, Chemicals, etc.)
Appropriate technologies II/B.K.K. (619) 421-1175
1700 Maxwell Road
Chula Vista, CA 91911

No transport vehicle may carry more than five gallons or 50 pounds of hazardous waste at one time. An Environmental Protection Agency identification number must be obtained prior to transporting material. The above site will not accept waste without this number. The contractor shall contact The Department of Health Services at (916) 324-1781 to obtain a temporary EPA ID number. Hazardous wastes may be hauled in larger quantities by licensed hazardous waste transporters. Any additional questions regarding the disposal of hazardous waste shall be directed to County of San Diego Hazardous Materials Management Division at (619) 338-2222.

Hazardous Waste
Suspected hazardous wastes will be analyzed to determine disposal options. Hazardous wastes generated onsite will be handled and disposed of according to applicable local, state, and

federal regulations. A solid or liquid waste is considered a hazardous waste if it exceeds the criteria list in the CCR, Title 22, Article 11.

B. EXTENDED DETENTION BASIN (DB)

Sediment shall be removed whenever significant sediment accumulation occurs beyond the inlet storm drain riprap; the facility is not intended to receive sediment laden runoff. Sediment shall be disposed of in such a manner that will prevent its return to the basin or movement into downstream areas during subsequent runoff.

The operational and maintenance needs of a DB are:

- Dispersion of alluvial sediment deposition at inlet structures thus limiting the localized ponding of water
- Periodic sediment removal when significant sediment accumulation occurs beyond the inlet storm drain riprap.
- Monitoring of the basin to ensure it is completely and properly drained. Basins should be designed to drain within 96 hours of a storm event.
- Outlet riser cleaning. Vegetation management to prevent marsh vegetation from taking hold, and to limit habitat for disease-carrying fauna.
- Removal of graffiti, grass trimmings, weeds, tree pruning, leaves, litter, and debris.
- Preventative maintenance on monitoring equipment.
- Vegetative stabilization of eroding banks and basal areas.

Inspection Frequency

The facility will be inspected and inspection visits will be completely documented:

- Quarterly
- After every large storm (after every storm monitored or those storms with more than 0.50 inch of precipitation).
- On a weekly basis during extended periods of wet weather.

Aesthetic and Functional Maintenance

Functional maintenance is important for performance and safety reasons. Aesthetic maintenance is important for public acceptance of stormwater facilities.

Aesthetic Maintenance

The following activities will be included in the aesthetic maintenance program:

- Graffiti Removal. Graffiti will be removed in a timely manner to improve the appearance of a DB, and to discourage additional graffiti or other acts of vandalism.
- Grass Trimming. Trimming of grass will be done around fences, the basin, outlet structures, and sampling structures.
- Weed Control. Weeds will be removed through mechanical means.

Functional Maintenance
Functional maintenance has two components:

- Preventive maintenance.
- Corrective maintenance.

Preventive Maintenance

Preventive maintenance will be performed regularly and on an as-needed basis. Preventive maintenance activities to be instituted at a DB are:

- Mowing. Vegetation in the DB will be kept at the average maximum height of 18 inches to prevent the establishment of marsh vegetation, the stagnation of water, and the development of faunal habitats.
- Trash and Debris. During each inspection and maintenance visit to the site, debris and trash removal will be conducted to reduce the potential for inlet and outlet structures and other components from becoming clogged and inoperable during storm events.
- Sediment Management. Alluvial deposits at the inlet structures may create zones of ponded water. Upon these occurrences these deposits will be graded within the DB in an effort to maintain the functionality of the BMP. Sediment grading will be accomplished by manually raking the deposits.
- Sediment Removal. Surface sediments will be removed when significant sediment accumulation occurs beyond the inlet storm drain riprap; the facility is not intended to receive sediment laden runoff. Vegetation removed with any surface sediment excavation activities will be replaced through reseeding. Disposal of sediments will comply with applicable local, county, state, or federal requirements.
- Mechanical Components. Regularly scheduled maintenance will be performed on valves, fence gates, locks, and access hatches in accordance with the manufacturers' recommendations. Mechanical components will be operated during each maintenance inspection to assure continued performance.
- Elimination of Mosquito Breeding Habitats. The most effective mosquito control program is one that eliminates potential breeding habitats.

Corrective Maintenance

Corrective maintenance is required on an emergency or non-routine basis to correct problems and to restore the intended operation and safe function of a DB. Corrective maintenance activities include:

- Removal of Debris and Sediment. Sediment, debris, and trash, which threaten the ability of a DB to store or convey water, will be removed immediately and properly disposed of.
- Structural Repairs. Repairs to any structural component of a DB will be made promptly (e.g., within 10 working days). Designers and contractors will conduct repairs where structural damage has occurred.

- Embankment and Slope Repairs. Damage to the embankments and slopes will be repaired quickly (e.g., within 10 working days).
- Erosion Repair. Where a reseeding program has been ineffective, or where other factors have created erosive conditions (i.e., pedestrian traffic, concentrated flow, etc.), corrective steps will be taken to prevent loss of soil and any subsequent danger to the performance of a DB. There are a number of corrective actions than can be taken. These include erosion control blankets, riprap, sodding, or reduced flow through the area. Design engineers will be consulted to address erosion problems if the solution is not evident.
- Fence Repair. Timely repair of fences (e.g., within 10 working days) will be performed to maintain the security of the site.
- Elimination of Trees and Woody Vegetation. Woody vegetation will be removed from embankments.
- Elimination of Animal Burrows. Animal burrows will be filled and steps taken to remove the animals if burrowing problems continue to occur (filling and compacting). If the problem persists, vector control specialists will be consulted regarding removal steps. This consulting is necessary as the threat of rabies in some areas may necessitate the animals being destroyed rather than relocated.
- General Facility Maintenance. In addition to the above elements of corrective maintenance, general corrective maintenance will address the overall facility and its associated components. If corrective maintenance is being done to one component, other components will be inspected to see if maintenance is needed.

ATTACHMENT G

Treatment Control BMP Certification for DPW Permitted Land Development Projects

After TCBMP construction, complete a TCBMP Certification form to verify with County staff that all constructed TCBMPs on the record plans match the approved TCBMPS in the most current SWMP. TCBMP Certification must be completed and verified for permit closure.

County of San Diego

DEPARTMENT OF PUBLIC WORKS

Treatment Control BMP Certification for DPW Permitted Land Development Projects

Permit Number (e.g. L-grading) _____ HSU Watershed _____

Project Name _____

Location / Address _____

Maintenance Notification/Agreement No.: _____

Responsible Party for Construction Phase

Developer's Name: _____

Address: _____

City _____ State _____ Zip _____

Email Address: _____

Phone Number: _____

Engineer of Work: _____

Engineer's Phone Number: _____

Responsible Party for Ongoing Maintenance

Owner's Name(s)* _____

Address: _____

City _____ State _____ Zip _____

Email Address: _____

Phone Number: _____

* Note: If a corporation or LLC, provide information for principal partner or Agent for Service of Process. If an HOA, provide information for the Board or property manager at time of project closeout.

Treatment Control BMPs (TCBMPs)[1,2]

(List all from SWMP)

Lot Number Or Location	Description/Type	Sheet

[1] All Priority Development Projects (PDPs) require a TCBMP.
[2] BMPs designed to treat stormwater shall be considered TCBMPs.

(Add sheet for all additional BMPs)

For Applicant to submit to PDCI:

- ☐ Copy of the final accepted SWMP and any accepted addendum.
- ☐ Copy of the most current plan showing the Stormwater TCBMP Table, plans/cross-section sheets of the TCBMPs and the location of each verified as-built TCBMP.
- ☐ Photograph of each TCBMP.
- ☐ Copy of the approved TCBMP maintenance agreement and associated security

By signing below, I certify that the treatment control BMP(s) for this project have been constructed and all BMPs are in substantial conformance with the approved plans and applicable regulations. I understand the County reserves the right to inspect the above BMPs to verify compliance with the approved plans and Watershed Protection Ordinance. Should it be determined that the BMPs were not constructed to plan or code, corrective actions may be necessary before permits can be closed.

Please sign your name and seal.

[SEAL]

Professional Engineer's Printed Name:

_____

Professional Engineer's Signed Name:

_____

Date: _____

COUNTY - OFFICIAL USE ONLY:

For PDCI:

PDCI Inspector: _____

Date Project has/expects to close: _____

Date Certification received from EOW: _____

By signing below, PDCI Inspector concurs that every noted TCBMP has been installed per plan.

PDCI Inspector's Signature: _____ Date: _____

FOR WPP:

Date Received from PDCI: _____

WPP Submittal Reviewer: _____

WPP Reviewer concurs that the information provided for the following TCBMPs is acceptable to enter into the TCBMP Maintenance verification inventory:

List **acceptable** TCBMPs:

WPP Reviewer's Signature: _____ Date: _____

☐ Provide a copy of the certification sheet to DPLU.

ATTACHMENT H

HMP Study

(Contact County staff to determine if this should be a separate report from the Major SWMP)

As a priority project, Otay Business Park is required to satisfy the hydromodification criteria detailed in the Final Hydromodification Management Plan (HMP) adopted in January 2011, and revised March 25, 2011. Calculations within this report utilize the San Diego BMP Sizing Calculator, with the Lindbergh Field rain gauge, and a lower threshold of 0.5Q2. Justification for the 0.5Q2 lower threshold is provided in Chang Consultants', "Hydromodification Screening for Otay Crossings", dated July 24, 2012 (the approved study, and justification for using this study, is provided for reference in Attachment I). Hydromodification land use calculations are shown on Attachments H-1 and H-2, provided within this section. Also provided within this section is San Diego BMP Sizing Calculator output and drawdown calculations for each proposed BMP. Minimum BMP sizing criteria are summarized as follows:

BMP SIZING CALCULATOR RESULTS						
BMP	MIN. VOLUME (CF)	MIN. PONDING DEPTH (FT)	VOLUME PROVIDED (CF)	LOWER ORIFICE SIZE (IN)	UPPER ORIFICE SIZE (IN)	DRAWDOWN TIME (HR)
DETENTION BASIN A	734,350	6	900,000	6	22	95
DETENTION BASIN B	293,350	14	423,900	3	16	96

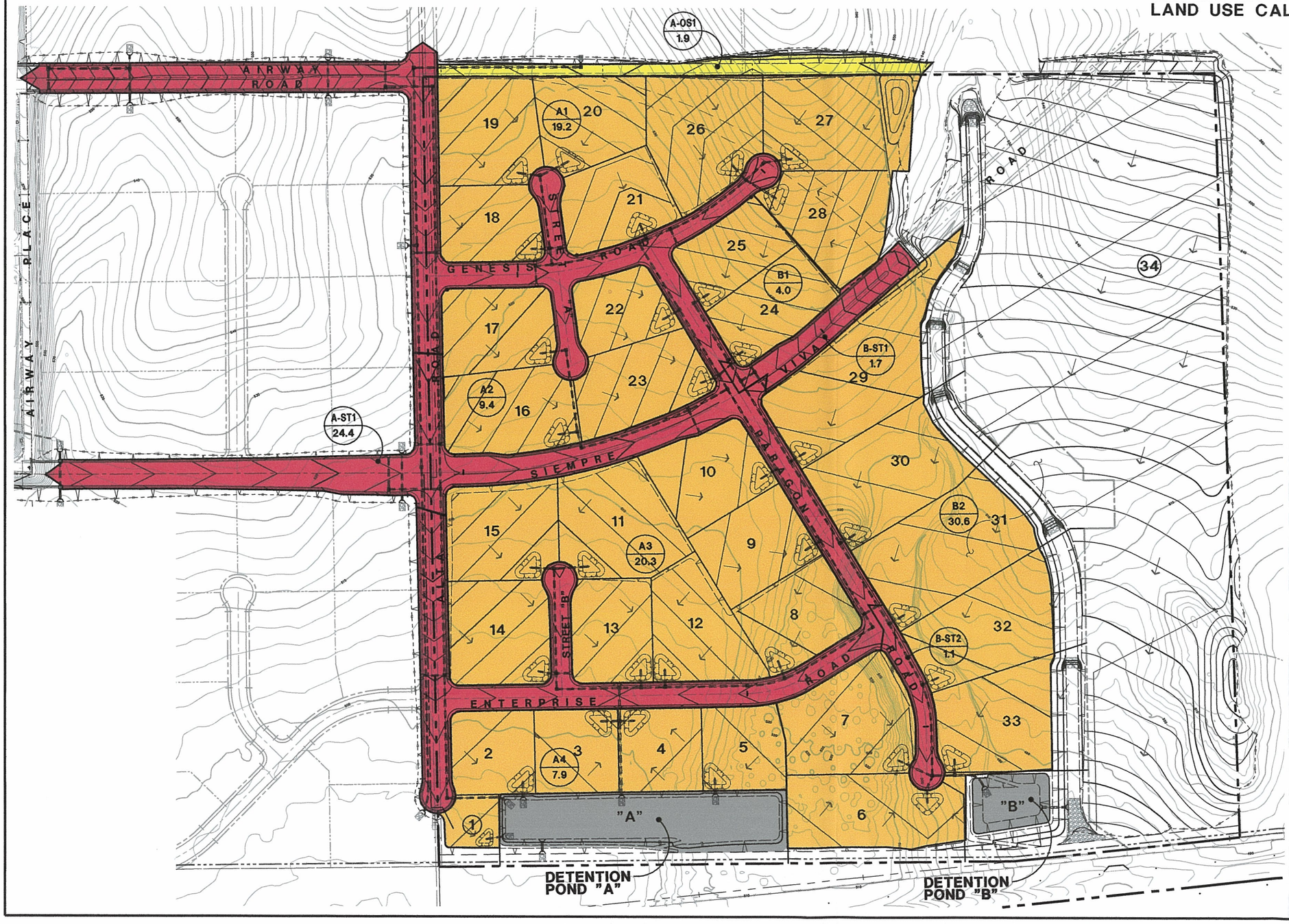
Hydromodification Calculations

LEGEND

- FUTURE PARKING LOT/BUILDING (80% IMPERVIOUS MAX.)
- ROADS (90% IMPERVIOUS)
- PERVIOUS, FLAT (<5% SLOPE)

NOTE: FOR ONSITE AREAS, SLOPE IS BASED ON THE PREDOMINANT SLOPE FOR THE BASIN IN THE PRE-PROJECT CONDITION

SEE EXHIBIT H-2 FOR POST-PROJECT LAND USE CALCULATIONS



STEVENS · CRESTO ENGINEERING, INC.
CIVIL ENGINEERS · PLANNERS · LAND SURVEYORS
9665 CHESAPEAKE DRIVE
SUITE 200
SAN DIEGO, CA 92123-1352
PHONE: 858.694.5660
FAX: 858.694.5661
www.scengr.com

OTAY BUSINESS PARK TRACT 5505R

SAN DIEGO, CALIFORNIA

ATTACHMENT "H-1" POST-PROJECT CONDITION

DATE: 01/31/14

SCE NO. 12009.02

SHEET **H-1**

1 OF 1 SHEET

POST-PROJECT LAND USE - BASIN A

SLOPE RANGE	BASIN A1, LOTS[1] (AC)	BASIN A2, LOTS[1] (AC)	BASIN A3, LOTS[1] (AC)	BASIN A4, LOTS[1] (AC)	BASIN A-ST1, STREETS[2] (AC)	BASIN A-OS1, DG ACCESS ROAD (AC)	TOTAL TRIBUTARY TO POND A (AC)
PERVIOUS TO PERVIOUS, FLAT (<5%)	3.84	1.88	4.06	1.58	2.44	1.9	**15.7**
PERVIOUS TO IMPERVIOUS, FLAT (<5%)	15.36	7.52	16.24	6.32	21.96		**67.4**
TOTALS	19.2	9.4	20.3	7.9	24.4	1.9	**83.1**

[1]FUTURE LOTS ARE ANTICIPATED TO BE 80% IMPERVIOUS; RUNOFF FROM LOTS WILL BE MITIGATED BY DETENTION BASIN A.
[2]PUBLIC STREETS WITHIN THE PROJECT BOUNDARY ARE APPROXIMATELY 90% IMPERVIOUS.

POST-PROJECT LAND USE - BASIN B

SLOPE RANGE	BASIN B1, LOTS[1] (AC)	BASIN B2, LOTS[1] (AC)	BASIN B-ST1, STREETS[2] (AC)	BASIN B-ST1, STREETS[2] (AC)	TOTAL TRIBUTARY TO POND B (AC)
PERVIOUS TO PERVIOUS, FLAT (<5%)	0.8	6.12	0.17	0.11	**7.2**
PERVIOUS TO IMPERVIOUS, FLAT (<5%)	3.2	24.48	1.53	0.99	**30.2**
TOTALS	4.0	30.6	1.7	1.1	**37.4**

[1]FUTURE LOTS ARE ANTICIPATED TO BE 80% IMPERVIOUS; RUNOFF FROM LOTS WILL BE MITIGATED BY DETENTION BASIN A.
[2]PUBLIC STREETS WITHIN THE PROJECT BOUNDARY ARE APPROXIMATELY 90% IMPERVIOUS.

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www.scengr.com

REVISIONS

OTAY BUSINESS PARK
TRACT 5505R
SAN DIEGO, CALIFORNIA

ATTACHMENT "H-2"
POST-PROJECT LAND USE

DATE: 01/31/14
SCE NO. 12009.02
SHEET
H-2
1 OF 1 SHEETS

X:\2012\12009\CAD\REPORTS\WQ\12009 WQ H2_CALCS.dwg 1/29/2014 4:13:53 PM PST

Project Summary

Project Name	Otay Business Park - TM5505
Project Applicant	
Jurisdiction	County of San Diego
Parcel (APN)	
Hydrologic Unit	Tijuana

Compliance Basin Summary

Basin Name:	DETENTION BASIN A
Receiving Water:	
Rainfall Basin	Lindbergh Field
Mean Annual Precipitation (inches)	10.2
Project Basin Area (acres):	83.10
Watershed Area (acres):	131.29
SCCWRP Lateral Channel Susceptiblity (H, M, L):	Low (Lateral)
SCCWRP Vertifical Channel Susceptiblity (H, M, L):	Low (Vertical)
Overall Channel Susceptibility (H, M, L):	LOW
Lower Flow Threshold (% of 2-Year Flow):	0.5

Drainage Management Area Summary

ID	Type	BMP ID	Description	Area (ac)	Pre-Project Cover	Post Surface Type	Drainage Soil	Slope
32966	Drains to Pond	BMP 1	Pervious to Pervious, Lots	11.36	Pervious (Pre)	PERVIOUS	Type D (high runoff - clay soi...	Flat - slope (less ...
32967	Drains to Pond	BMP 1	Pervious to Impervious, Lots	45.44	Pervious (Pre)	IMPERVIOUS	Type D (high runoff - clay soi...	Flat - slope (less ...
32968	Drains to Pond	BMP 1	Pervious to Pervious, Roads	2.44	Pervious (Pre)	PERVIOUS	Type D (high runoff - clay soi...	Flat - slope (less ...
32969	Drains to Pond	BMP 1	Pervious to Impervious, Roads	21.96	Pervious (Pre)	IMPERVIOUS	Type D (high runoff - clay soi...	Flat - slope (less ...
33169	Drains to Pond	BMP 1	Pervious to Pervious, OS - DG Access Rd	1.9	Pervious (Pre)	PERVIOUS	Type D (high runoff - clay soi...	Flat - slope (less ...

Pond Facility Summary

Scenario	Description	Bottom Area (sqft)	Top Area (sqft)	Depth (ft)	Volume (cft)	Low Orifice (in)	Low Invert (ft)	High Orifice (in)	High Invert (ft)	Weir Length (ft)	Weir Invert (ft)	Facility Soil	Drawdown (hrs)
Design A	Detention Basin A	114000	130782	6	734347.9	6.00	0.00	22.00	3.1	10.00	4.9	D	95.00

Project Summary

Project Name	Otay Business Park - TM5505
Project Applicant	
Jurisdiction	County of San Diego
Parcel (APN)	
Hydrologic Unit	Tijuana

Compliance Basin Summary

Basin Name:	DETENTION BASIN B
Receiving Water:	
Rainfall Basin	Lindbergh Field
Mean Annual Precipitation (inches)	10.2
Project Basin Area (acres):	37.40
Watershed Area (acres):	680.91
SCCWRP Lateral Channel Susceptiblity (H, M, L):	Low (Lateral)
SCCWRP Vertifical Channel Susceptiblity (H, M, L):	Low (Vertical)
Overall Channel Susceptibility (H, M, L):	LOW
Lower Flow Threshold (% of 2-Year Flow):	0.5

Drainage Management Area Summary

ID	Type	BMP ID	Description	Area (ac)	Pre-Project Cover	Post Surface Type	Drainage Soil	Slope
32953	Drains to Pond	BMP 1	Pervious to Pervious, Lots	6.92	Pervious (Pre)	PERVIOUS	Type D (high runoff - clay soi...	Flat - slope (less ...
32956	Drains to Pond	BMP 1	Pervious to Impervious, Lots	27.68	Pervious (Pre)	IMPERVIOUS	Type D (high runoff - clay soi...	Flat - slope (less ...
32964	Drains to Pond	BMP 1	Pervious to Pervious, Roads	0.28	Pervious (Pre)	PERVIOUS	Type D (high runoff - clay soi...	Flat - slope (less ...
32965	Drains to Pond	BMP 1	Pervious to Impervious, Roads	2.52	Pervious (Pre)	IMPERVIOUS	Type D (high runoff - clay soi...	Flat - slope (less ...

Pond Facility Summary

Scenario	Description	Bottom Area (sqft)	Top Area (sqft)	Depth (ft)	Volume (cft)	Low Orifice (in)	Low Invert (ft)	High Orifice (in)	High Invert (ft)	Weir Length (ft)	Weir Invert (ft)	Facility Soil	Drawdown (hrs)
Design A	Detention Basin B	13000	28905	14	293341.7	3.00	0.00	16.00	11.65	10.00	13.00	D	96.00

ATTACHMENT I

Geomorphic Assessment

(Contact County staff immediately if you are planning to conduct a Geomorphic Assessment. A Geomorphic Assessment must be performed if the project is using a "Medium" low flow threshold of 0.3Q2 or a "High" low flow threshold of 0.5Q2.)

NOTE: This study was approved with TM 5405R, a project immediately upstream of Otay Business Park. The study performs a geomorphic assessment beginning at the outfall of TM 5405R, which is the northern boundary of Otay Business Park, and continues south to the US-Mexico border. Given that Otay Business Park is contained within the domain of analysis, the results of that study are applicable to the project; see letter that follows.

ChangConsultants
Civil Engineering▫Hydrology▫Hydraulics▫Sedimentation

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Rancho Santa Fe, CA 92067-4496
T: 858.692.0760
F: 858.832.1402
wayne@changconsultants.com

March 17, 2014

Bryan Hill
Stevens-Cresto Engineering, Inc.
9665 Chesapeake Dr. Suite 320
San Diego, CA 92123

Subject: Otay Business Park Revised Tentative Map

Dear Brian:

I have reviewed your February 2014 Preliminary Grading Plan (PGP) for the Otay Business Park Revised Tentative Map as well as my approved July 24, 2012 report, *Hydromodification Screening for Otay Crossings.* The PGP proposes two storm drain discharge locations (or two points of compliance for hydromodification purposes) along the southerly project boundary. Each point of compliance discharges directly to a study reach that was analyzed in my July 2012 report. Therefore, the July 2012 report results apply to those portions of the Otay Business Park project that are tributary to the points of compliance. The July 2012 report concluded that each of the two study reaches have a low susceptibility to erosion, i.e., the hydromodification sizing can be based on $0.5Q_2$.

Sincerely,

Wayne W. Chang, M.S., P.E.

HYDROMODIFICATION SCREENING

FOR

OTAY CROSSINGS

(TPM 5405 RPL7R)

July 24, 2012

Wayne W. Chang, MS, PE 46548

ChangConsultants

Civil Engineering ◦ Hydrology ◦ Hydraulics ◦ Sedimentation

P.O. Box 9496
Rancho Santa Fe, CA 92067
(858) 692-0760

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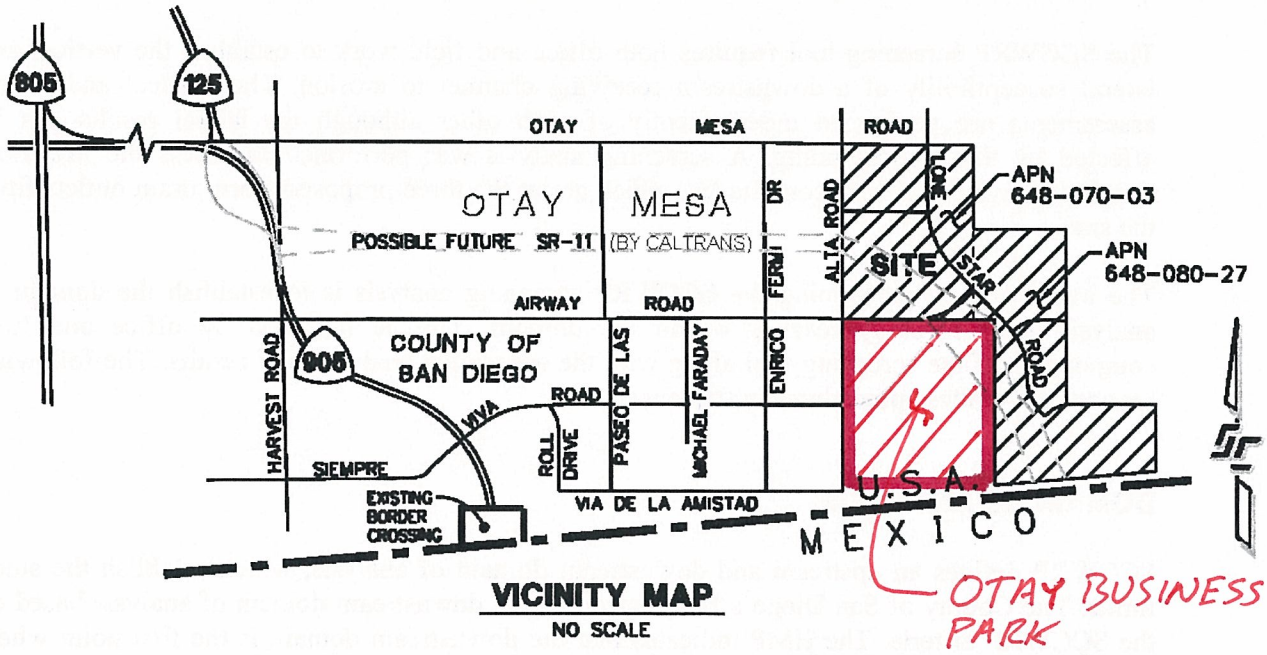
APPENDICES

MAP POCKET

INTRODUCTION

The County of San Diego's March 2011, *Final Hydromodification Management Plan,* and January 8, 2011, *Standard Urban Stormwater Mitigation Plan* (SUSMP) outline low flow thresholds for hydromodification analyses. The thresholds are based on a percentage of the pre-project 2-year flow (Q_2), i.e., $0.1Q_2$ (low flow threshold and high susceptibility to erosion), $0.3Q_2$ (medium flow threshold and medium susceptibility to erosion), or $0.5Q_2$ (high flow threshold and low susceptibility to erosion). A flow threshold of $0.1Q_2$ represents a natural downstream receiving conveyance system with a high susceptibility to bed and/or bank erosion. This is the default value used for hydromodification analyses and will result in the most conservative (largest) on-site facility sizing. A flow threshold of $0.3Q_2$ or $0.5Q_2$ represents downstream receiving conveyance systems with a medium or low susceptibility to erosion, respectively. In order to qualify for a medium or low erosion susceptibility rating, a project must perform a channel screening analysis based on the March 2010, *Hydromodification Screening Tools: Field Manual for Assessing Channel Susceptibility,* developed by the Southern California Coastal Water Research Project (SCCWRP). The SCCWRP results are compared with the critical shear stress calculator results from the County of San Diego's BMP Sizing Calculator to establish the appropriate erosion susceptibility threshold of low, medium, or high.



This report provides hydromodification screening analyses for the Otay Crossings project being designed by Stevens-Cresto Engineering, Inc. The project will be an industrial/commercial subdivision located immediately east of the future southerly extension of Alta Road and south of the future easterly extension of Otay Mesa Road in the Otay Mesa community of the county of San Diego (see the Vicinity Map above as well as the Study Area Exhibit in the map pocket). The project site covers approximately 311.5 acres and generally is gently sloping towards the south. The site and surrounding area is currently undeveloped and primarily supports natural

vegetation consisting of grasses and weeds (see figures following this report text). There is some off-site surface runoff onto the site primarily from the north, but also from the east and west. The proposed project will provide several drainage facilities around its perimeter to pick up the off-site flows. The off-site and on-site flows will be conveyed through the project site by proposed on-site drainage facilities. The on-site facilities will discharge away from the site at three independent locations along the southerly grading limits.

Downstream of the project, surface runoff from the three discharge points flows in a southerly direction along three independent minor streams within the natural ground surface. These are identified as the west stream, central stream, and east stream. The west, central, and east streams convey flow approximately 3,224 feet, 2,448 feet, and 2,563 feet south to box culverts within the US border patrol fence (see Figures 6, 7, 13, 14, 20, and 21). Each box culvert conveys runoff a distance of approximately 30 feet through the fence. There are concrete aprons at the upstream and downstream ends of each box culvert (see Figures 6, 13, and 20). The aprons are about 15 feet long each, so the total length of each box culvert and its aprons is approximately 60 feet. The runoff then travels from each box culvert outlet south approximately 80 feet over natural ground towards a second parallel border fence (see Figures 8, 15, and 22), which is generally along the US/Mexico international boundary. Openings in the second fence allow the runoff to pass into Mexico, where it is conveyed by a hardened drainage system.

The SCCWRP screening tool requires both office and field work to establish the vertical and lateral susceptibility of a downstream receiving channel to erosion. The vertical and lateral assessments are performed independently of each other although the lateral results can be affected by the vertical rating. A screening analysis was performed to assess the low flow threshold for the points of compliance, which are at the three proposed storm drain outlets from the site.

The initial step in performing the SCCWRP screening analysis is to establish the domain of analysis and the study reaches within the domain. This is followed by office and field components of the screening tool along with the associated analyses and results. The following sections cover these procedures in sequence.

DOMAIN OF ANALYSIS

SCCWRP defines an upstream and downstream domain of analysis, which establish the study limits. The County of San Diego's HMP specifies the downstream domain of analysis based on the SCCWRP criteria. The HMP indicates that the downstream domain is the first point where one of these is reached:

- at least one reach downstream of the first grade control point
- tidal backwater/lentic waterbody
- equal order tributary
- accumulation of 50 percent drainage area for stream systems or 100 percent drainage area for urban conveyance systems (storm drains, hardened channels, etc.)

The upstream limit is defined as:

- proceed upstream for 20 channel top widths or to the first grade control point, whichever comes first. Identify hard points that can check headward migration and evidence of active headcutting.

SCCWRP defines the maximum spatial unit, or reach (a reach is circa 20 channel widths), for assigning a susceptibility rating within the domain of analysis to be 200 meters (656 feet). If the domain of analysis is greater than 200 meters, the study area should be subdivided into smaller reaches of less than 200 meters for analysis. Most of the units in the HMP's SCCWRP analysis are metric. Metric units are used in this report only where given so in the HMP. Otherwise English units are used.

Downstream Domain of Analysis

The downstream domain of analysis for the study area has been determined by assessing and comparing the four bullet items above. As discussed previously, the on-site project runoff will be collected by proposed drainage facilities that outlet at three independent locations along the southerly project limits. Each of the three outlet locations is a point of compliance (POC) and a separate downstream domain of analysis is selected below each POC.

Per the first bullet item, the first permanent grade control below each POC is at its associated reinforced concrete box culverts along the northerly border patrol fence (see Figures 6, 7, 13, 14, 20, and 21). The entrance to each of the three (west, central, and east) independent box culverts is a concrete-lined apron, so the concrete lining and connected culverts form the first permanent grade control below each POC. Runoff downstream of each of the three box culverts will flow over the ground surface for a distance of approximately 80 feet before entering one of three separate hardened, non-erodible drainage conveyances within Mexico (see Figures 8, 15, 22, 24, 25, and 26). The downstream domain of analysis based on a permanent grade control must extend one reach below the grade control. For the west, central, and east POCs, one reach was taken to be the 80 feet of ground surface between the downstream end of the associated box culverts/concrete apron and the hardened drainage facility in Mexico. The 80 feet is the maximum reach length possible since the Mexican drainage facility further downstream is non-erodible.

The second bullet item is the tidal backwater or lentic (standing or still water such as ponds, pools, marshes, lakes, etc.) waterbody location. A tidal backwater or lentic waterbody does not exist between the project site and Mexico. Therefore, the tidal backwater or lentic waterbody will be further downstream of the downstream domain of analysis established by the permanent grade control criteria.

The final two bullet items are related to the tributary drainage area. The overall drainage area tributary to the west, central, and east permanent grade controls cover approximately 467.84, 733.56, and 257.53 acres, respectively (see the Study Area Exhibit in the map pocket). These areas include the project site as well as the tributary off-site areas. The additional area between the west, central, and east permanent grade controls and the US/Mexico boundary are 10.84,

4.24, and 1.74 acres, respectively. There are no lateral drainages tributary to these additional areas, so a 50 percent or equal order (100 percent) tributary will not be reached until some point beyond the international border.

Based on the above information, the downstream domain of analysis for the west, central, and east POCs is based on one reach below their first grade control point, which occurs at the southerly border fence located along the US/Mexico boundary. Of the four bullet criteria, this is the first point reached below the POCs.

Upstream Domain of Analysis
The proposed drainage facilities at the three POCs outlet into the uppermost end of the receiving drainage courses. Since the three natural drainage courses do not extend upstream of the drainage facility outlets, the upstream domain of analysis location will be at the POCs.

Study Reaches within Domain of Analysis
The entire domain of analysis extends from each of the three POCs to the US/Mexico boundary. For each stream, the flow path between the POC and northerly border patrol fence was divided into study reaches of less than 200 meters (656 feet). The west stream covers 3,225 feet between the west POC and the northerly border patrol fence, so this stream was divided into five study reaches (W1 – 656 feet, W2 – 652 feet, W3 – 654 feet, W4 – 644 feet, and W5 – 619 feet). The central stream covers 2,448 feet and was divided into four study reaches (C1 – 564 feet, C2 – 611 feet, C3 – 622 feet, and C4 – 651 feet). The east stream covers 2,563 feet and was divided into four study reaches (E1 – 615 feet, E2 – 651 feet, E3 – 645 feet, and E4 – 651 feet).

For each stream, an additional study reach (W6, C5, and E5) was defined over the 80 feet between the lower end of each permanent grade control to the US/Mexico boundary. Each study reach length is less than the 20 channel top width reach length specified by SCCWRP.

INITIAL DESKTOP ANALYSIS

After the domain of analysis is established, SCCWRP requires an "initial desktop analysis" that involves office work. The initial desktop analysis establishes the watershed area, mean annual precipitation, valley slope, and valley width. These terms are defined in Form 1, which is included in Appendix A. SCCWRP recommends the use of National Elevation Data (NED) to determine the watershed area, valley slope, and valley width. The NED data is similar to USGS mapping, so it is not very detailed. For this report, 2-foot contour interval flown topographic mapping was available for the project and the majority of the surrounding study area. Since this is more accurate than NED mapping, it will yield better results. A site investigation was performed that confirmed the accuracy of the mapping.

The watershed areas tributary to the study reaches were determined from the flown topographic mapping, SANGIS' 20-foot contour interval mapping, and the proposed grading plans. The flown topographic mapping did not cover a portion of the upper watershed, so SANGIS mapping was used for this area. The watershed delineation is included on the Study Area Exhibit in the map pocket and shows that the areas tributary to the west, central, and east study reaches.

The mean annual precipitation was obtained from the rain gage closest to the site. This is the Western Regional Climate Center's Lower Otay Reservoir gage (see Appendix A), which is approximately 3.8 miles from the site. The average annual rainfall measured at this gage for the period of record from 1940 to 1956 is 11.1 inches. Since the period of record does not cover an overly extensive time period, data for the next closest rain gage at Bonita was also reviewed. The Bonita gage is over 10 miles from the site, but has a period of record from 1915 to 1970. The average annual rainfall at Bonita over this period is 11.5 inches. Since this rainfall is similar to the Lower Otay Reservoir gage data, the Lower Otay Reservoir data was determined to appropriately represent the mean annual precipitation for the project.

The valley slope of the west, central, and east study reaches were determined from the 2-foot contour interval topographic mapping. The valley slope is the longitudinal slope of the channel bed along the flow line, so it is determined by dividing the elevation difference within a study reach by the length of the flow line. For study reach W6, a smart level was used (see figure in Appendix A) because the topographic mapping did not provide elevation data at the US/Mexico boundary. The valley width is the valley bottom width dictated by breaks in the hillslope and is subtle in many of the study reaches since they are in a gently rolling valley as seen in the figures. The average valley width of each reach was determined from the topographic mapping and aerial photographs, and verified through field observations. The valley slope and valley width within each reach are included in Table 1. The valley widths are identified on the Study Area Exhibit.

Reach	Tributary Drainage Area, sq. mi.	Valley Slope, m/m	Valley Width, m
W1	0.21	0.0145	12.2
W2	0.35	0.0138	10.7
W3	0.36	0.0122	12.2
W4	0.41	0.0115	15.8
W5	0.73	0.0053	18.3
W6	0.75	0.0220	17.0
C1	1.06	0.0230	9.1
C2	1.08	0.0164	12.5
C3	1.08	0.0129	12.2
C4	1.15	0.0081	15.2
C5	1.15	0.0188	24.4
E1	0.27	0.0164	13.4
E2	0.28	0.0214	9.8
E3	0.30	0.0186	13.7
E4	0.40	0.0141	10.4
E5	0.41	0.0212	9.1

Table 1. Summary of Drainage Area, Valley Slope, and Valley Width

These values were input to a spreadsheet to calculate the simulated peak flow, screening index, and valley width index outlined in Form 1. The input data and results are tabulated in Appendix A. This completes the initial desktop analysis.

FIELD SCREENING

After the initial desktop analysis is complete, a field assessment must be performed. The field assessment is used to establish a natural channel's vertical and lateral susceptibility to erosion. SCCWRP states that although they are admittedly linked, vertical and lateral susceptibility are assessed separately for several reasons. First, vertical and lateral responses are primarily controlled by different types of resistance, which, when assessed separately, may improve ease of use and lead to increased repeatability compared to an integrated, cross-dimensional assessment. Second, the mechanistic differences between vertical and lateral responses point to different modeling tools and potentially different management strategies. Having separate screening ratings may better direct users and managers to the most appropriate tools for subsequent analyses.

The field screening tool uses combinations of decision trees and checklists. Decision trees are typically used when a question can be answered fairly definitively and/or quantitatively (e.g., d_{50} < 16 mm). Checklists are used where answers are relatively qualitative (e.g., the condition of a grade control). Low, medium, high, and very high ratings are applied separately to the vertical and lateral analyses. When the vertical and lateral analyses return divergent values, the most conservative value shall be selected as the flow threshold for the hydromodification analyses.

Vertical Stability

The purpose of the vertical stability decision tree (Figure 6-4 in the County of San Diego HMP) is to assess the state of the channel bed with a particular focus on the risk of incision (i.e., down cutting). The decision tree is included in Figure 42. The first step is to assess the channel bed resistance. There are three categories defined as follows:

1. Labile Bed – sand-dominated bed, little resistant substrate.

2. Transitional/Intermediate Bed – bed typically characterized by gravel/small cobble, Intermediate level of resistance of the substrate and uncertain potential for armoring.

3. Threshold Bed (Coarse/Armored Bed) – armored with large cobbles or larger bed material or highly-resistant bed substrate (i.e., bedrock).

Figures 26 through 41 show photographs of the bed material within the streams. A gravelometer is included in the photographs for reference. Each square on the gravelometer indicates grain size in millimeters (the squares range from 2 mm to 180 mm). Based on the photographs and site investigation, the bed material and resistance is generally within the transitional/intermediate bed category. There was no evidence of a threshold bed condition. However, some bed areas contained smaller grain sizes found in a labile bed. A pebble count was performed that

determined the median (d_{50}) bed material size to be 22.6, 16, and 22.6 millimeters (mm) in the west, central, and east Streams, respectively (see Appendix B). Figure 6-4 in the County HMP indicates that a d_{50} of 16 mm or greater is within the transitional/intermediate bed category. Dr. Eric Stein from SCCWRP, who co-authored the *Hydromodification Screening Tools: Field Manual* in the *Final Hydromodification Management Plan* (HMP), indicated that it would be appropriate to analyze channels with multiple factors that impact erodibility using the transitional/intermediate bed procedure. This requires the most rigorous steps and will generate the appropriate results for the size range.

Transitional/intermediate beds cover a wide susceptibility/potential response range and need to be assessed in greater detail to develop a weight of evidence for the appropriate screening rating. The three primary risk factors used to assess vertical susceptibility for channels with transitional/intermediate bed materials are:

1. Armoring potential – three states (Checklist 1)

2. Grade control – three states (Checklist 2)

3. Proximity to regionally-calibrated incision/braiding threshold (Mobility Index Threshold – Probability Diagram)

These three risk factors are assessed using checklists and a diagram (see Appendix B), and the results of each are combined to provide a final vertical susceptibility rating for the intermediate/transitional bed-material group. Each checklist and diagram contains a Category A, B, or C rating. Category A is the most resistant to vertical changes while Category C is the most susceptible.

Checklist 1 determines armoring potential of the channel bed. The channel bed along each of the three streams is within Category B, which represents intermediate bed material of unknown resistance or unknown armoring potential due to a surface veneer such as vegetation. The soil was probed and penetration was relatively difficult through the underlying layer.

Checklist 2 determines grade control characteristics of the channel bed. SCCWRP states that grade controls can be natural. Examples are vegetation or confluences with a larger waterbody. As verified with photographs and during a site investigation, each of the three streams contains a dense, uniform cover of vegetation (see the figures). The plants and their roots serve as effective natural grade controls. The spacing of the plants along the streams is less than a meter. Evidence of the effectiveness of the natural grade controls is the absence of headcutting and mass wasting (large vertical erosion of a channel bank) throughout the streams. Consequently, the dense vegetation acts as grade controls. Since the underlying resistance is uncertain, the study reach in each stream is within Category B on Checklist 2.

The Mobility Index Threshold is a probability diagram that depicts the risk of incising or braiding based on the potential stream power of the valley relative to the median particle diameter. The threshold is based on regional data from Dr. Howard Chang of Chang Consultants and others. The probability diagram is based on d_{50} as well as the Screening Index determined in

the initial desktop analysis (see Appendix A). d_{50} is derived from a pebble count in which a minimum of 100 particles is obtained along transects at the site. A pebble count was performed for each reach within each stream (16 pebble counts total). The spacing of each sample location within a reach was determined by dividing the total length of the reach by 100. This distance was paced off in the field and a sample taken. The extents of each reach was estimated in the field by reviewing an aerial photograph and topographic mapping. SCCRWP states that if fines less than ½-inch thick are at a sample point, it is appropriate to sample the coarser buried substrate. In many locations, the sample had to be taken from under a uniform layer of grass.

The d_{50} value is the particle size in which 50 percent of the particles are smaller and 50 percent are larger. The pebble count results for each reach in the east, central, and west streams are included in Appendix B. The results show a d_{50} of 16 millimeters for reaches W1 through W5, C1 through C3, and E2 through E4. The results show a d_{50} of 22.6 millimeters for reaches C4 and E1. The results show a d_{50} of 45 millimeters for reach W6 and 64 millimeters for reaches C5 and E5.

The screening index values for the reaches within each stream are tabulated on Form 1 in Appendix A. The Mobility Index Threshold diagram in Appendix B shows that a reach with a d_{50} of 16 millimeters has less than 50 percent probability of incising or braiding if its 10-Year Screening Index (INDEX value from Form 1 in Appendix A) is less than 0.049. The reaches with a d_{50} of 22.6, 45, and 64 millimeters have less than 50 percent probability of incising or braiding at successively higher INDEX values. A larger d_{50} (and higher INDEX value) reflects a channel that is more resistant to incising and braiding since larger particles form a more stable channel. The INDEX values from Form 1 for all of the study reaches are less than or equal to 0.043. This is lower than the lowest INDEX value of 0.049 associated with the smallest d_{50} of 16 millimeters. Therefore, this global comparison shows that each of the study reaches has less than 50 percent probability of incising and falls within Category A.

The overall vertical rating is determined from the Checklist 1, Checklist 2, and Mobility Index Threshold results. The scoring is based on the following values:

Category A = 3, Category B = 6, Category C = 9

The vertical rating score is based on these values and the equation:

$$\text{Vertical Rating} = [(\text{armoring} \times \text{grade control})^{1/2} \times \text{screening index score}]^{1/2}$$
$$= [(6 \times 6)^{1/2} \times 3]^{1/2}$$
$$= 4.2$$

Since the vertical rating is less than 4.5, each reach has a low threshold for vertical susceptibility.

Lateral Stability

The purpose of the lateral decision tree (Figure 6-5 from County of San Diego HMP included in Figure 43) is to assess the state of the channel banks with a focus on the risk of widening. Channels can widen from either bank failure or through fluvial processes such as chute cutoffs, avulsions, and braiding. Widening through fluvial avulsions/active braiding is a relatively

straightforward observation. If braiding is not already occurring, the next logical step is to assess the condition of the banks. Banks fail through a variety of mechanisms; however, one of the most important distinctions is whether they fail in mass (as many particles) or by fluvial detachment of individual particles. Although much research is dedicated to the combined effects of weakening, fluvial erosion, and mass failure, SCCWRP found it valuable to segregate bank types based on the inference of the dominant failure mechanism (as the management approach may vary based on the dominant failure mechanism). A decision tree (Form 4 in Appendix B) is used in conducting the lateral susceptibility assessment. Definitions and photographic examples are also provided below for terms used in the lateral susceptibility assessment.

The first step in the decision tree is to determine if lateral adjustments are occurring. The adjustments can take the form of extensive mass wasting (greater than 50 percent of the banks are exhibiting planar, slab, or rotational failures and/or scalloping, undermining, and/or tension cracks). The adjustments can also involve extensive fluvial erosion (significant and frequent bank cuts on over 50 percent of the banks). Neither mass wasting nor extensive fluvial erosion was evident within any of the reaches during a field investigation. The drainage courses all have a gently sloping cross-section with very gradual banks that are not subject to erosion (see the figures).

The next step in the Form 4 decision tree is to assess the consolidation of the bank material. The banks were moderate to well-consolidated. This determination was made because the ground surface was difficult to penetrate with a probe. In addition, the banks showed no evidence of crumbling and were composed of relatively well-packed particles.

Form 6 (see Appendix B) is used to assess the probability of mass wasting. Form 6 identifies a 10, 50, and 90 percent probability based on the bank angle and bank height. Based on the topographic mapping, figures, and site investigation, the bank angles in all three streams are flatter than 30 degrees. Form 6 shows that the probably of mass wasting and bank failure has less than 10 percent risk for a 30 degree bank angle or less regardless of the bank height.

The final two steps in the Form 4 decision tree are based on the braiding risk determined from the vertical rating as well as the Valley Width Index (VWI) calculated in Appendix A. If the vertical rating is high, the braiding risk is considered to be greater than 50 percent. Excessive braiding can lead to lateral bank failure. For the study reaches within the three streams the vertical rating is low, so the braiding risk is less than 50 percent. Furthermore, a VWI greater than 2 represents channels unconfined by bedrock or hillslope and, hence, subject to lateral migration. The VWI calculations in the spreadsheet in Appendix A show that the VWI for each reach is less than 2.

From the above steps, the lateral susceptibility rating is low (red circles are included on the Form 4: Lateral Susceptibility Field Sheet decision tree in Appendix B showing the decision path).

CONCLUSION

The SCCWRP channel screening tools were used to assess the downstream channel susceptibility for the Otay Crossings project. The project and tributary off-site runoff will be collected by proposed on-site drainage systems and conveyed through the site. The drainage systems discharge at three separate locations along the southerly project limits in a southerly direction towards the US/Mexico boundary. The receiving drainage courses are naturally-lined upstream of Mexico except for existing box culverts and concrete aprons along the northerly border patrol fence and riprap between the two fences. The receiving drainage courses are hardened just beyond the international border. The naturally-lined streams are gently sloping in the direction of flow and contain mild banks. Consequently, there is no evidence of vertical or lateral erosion in the streams. The downstream channel assessment for the drainage courses was performed based on office analyses and field work. The results indicate a low threshold for vertical and lateral susceptibilities for each of the study reaches in each of the three streams, which is consistent with the in-situ conditions.

The HMP requires that these results be compared with the critical stress calculator results incorporated in the County of San Diego's BMP Sizing Calculator. The BMP Sizing Calculator critical stress results are included in Appendix B for the reaches in each stream. The critical stress calculator is based on the channel top width. In most cases the channel top width is similar to the valley width. However, for reaches W6, C2 through C4, and E3 the channel top width is narrower than the valley width because the main flow channel is within the broader valley. Based on these values, the critical stress results returned a low threshold. Therefore, the SCCWRP analyses and critical stress calculator demonstrate that the project can be designed assuming a low susceptibility to erosion, i.e., $0.5Q_2$.

Figure 1. Looking Downstream from West POC (towards W1 / W2)

Figure 2. Looking Upstream near Middle of West Stream (towards W1 / W2)

Figure 3. Looking Downstream near Middle of West Stream (towards W3 / W4)

Figure 4. Looking Upstream near Lower End of West Stream (towards W3 / W4)

Figure 5. Looking Downstream near Lower End of West Stream (towards W5)

Figure 6. Permanent Grade Control near Downstream End of West Stream

Figure 7. Downstream End of Box Culverts at Permanent Grade Control in West Stream (W6)

Figure 8. Looking Downstream in West Stream (W6) at Southerly Border Fence (US/Mexico Border)

Figure 9. Looking Downstream from Central POC (towards C1 / C2)

Figure 10. Looking Upstream near Middle of Central Stream (towards C1)

Figure 11. Looking Downstream near Middle of Central Stream (towards C2 / C3)

Figure 12. Looking Upstream near Lower End of Central Stream (towards C3 / C4)

Figure 13. Permanent Grade Control near Downstream End of Central Stream

Figure 14. Downstream End of Box Culverts at Permanent Grade Control in Central Stream (C5)

Figure 15. Looking Downstream in Central Stream (C5) at Southerly Border Fence (US/Mexico Border)

Figure 16. Looking Downstream near East POC (towards E1 / E2)

Figure 17. Looking Upstream near Upper Portion of East Stream (towards E1)

Figure 18. Looking Downstream near Upper Portion of East Stream (towards E2 / E3)

Figure 19. Looking Upstream near Lower Portion of East Stream (towards E3 and E4)

Figure 20. Permanent Grade Control near Downstream End of East Stream

Figure 21. Downstream End of Box Culverts at Permanent Grade Control in East Stream (E5)

Figure 22. Looking Downstream in East Stream (E5) at Southerly Border Fence (US/Mexico Border)

Figure 23. Hardened Drainage Facility in Mexico at Downstream End of West Stream

Figure 24. Hardened Drainage Culvert in Mexico at Downstream End of Central Stream

Figure 25. Hardened Drainage Culvert in Mexico at Downstream End of East Stream

Figure 26. Gravelometer within Reach W1

Figure 27. Gravelometer within Reach W2

Figure 28. Gravelometer within Reach W3

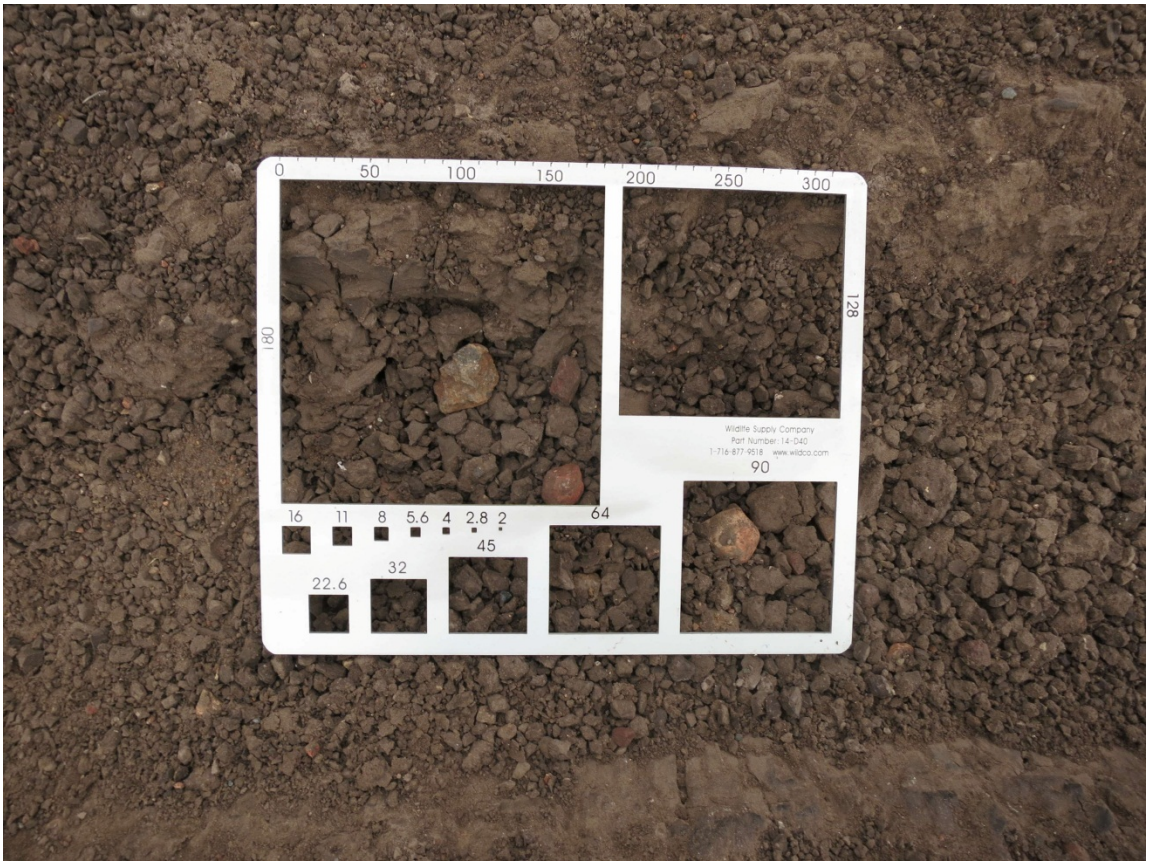


Figure 29. Gravelometer within Reach W4

Figure 30. Gravelometer within Reach W5

Figure 31. Gravelometer within Reach W6

Figure 32. Gravelometer within Reach C1

Figure 33. Gravelometer within Reach C2

Figure 34. Gravelometer within Reach C3

Figure 35. Gravelometer within Reach C4

Figure 36. Gravelometer within Reach C5

Figure 37. Gravelometer within Reach E1

Figure 38. Gravelometer within Reach E2

Figure 39. Gravelometer within Reach E3

Figure 40. Gravelometer with Reach E4

Figure 41. Gravelometer within Reach E5

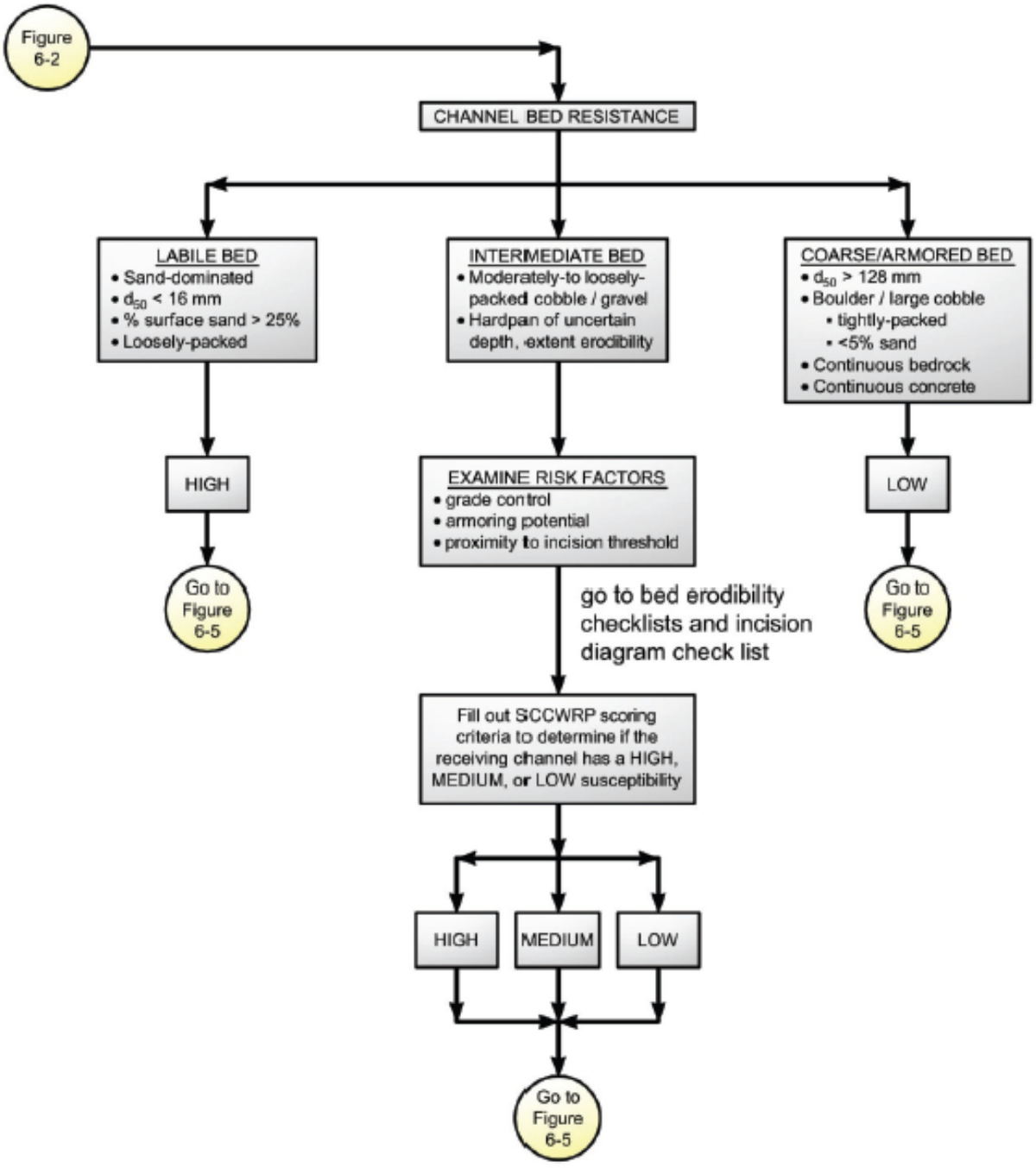


Figure 6-4. SCCWRP Vertical Susceptibility

Figure 42. SCCWRP Vertical Channel Susceptibility Matrix

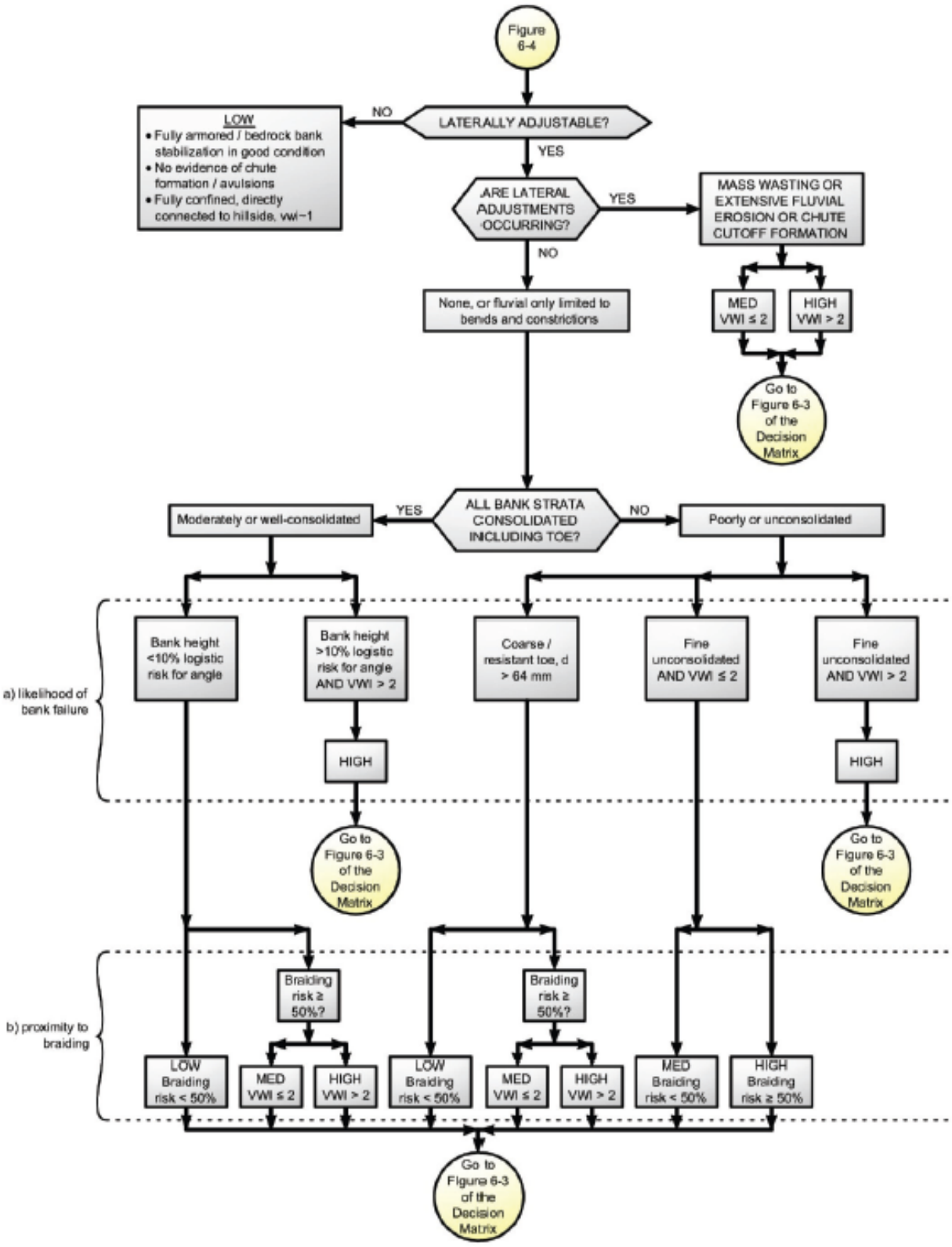


Figure 6-5. Lateral Channel Susceptibility

Figure 43. SCCWRP Lateral Channel Susceptibility Matrix

APPENDIX A

SCCWRP INITIAL DESKTOP ANALYSIS

FORM 1: INITIAL DESKTOP ANALYSIS

Complete all shaded sections.

IF required at multiple locations, circle one of the following site types:

Applicant Site / Upstream Extent / Downstream Extent

Location: Latitude: 32.5634 Longitude: -116.9106

Description (river name, crossing streets, etc.): Otay Crossings - southeast of future intersection of Otay Mesa Road and Alta Road.

GIS Parameters: The International System of Units (SI) is used throughout the assessment as the field standard and for consistency with the broader scientific community. However, as the singular exception, US Customary units are used for contributing drainage area (A) and mean annual precipitation (P) to apply regional flow equations after the USGS. See SCCWRP Technical Report 607 for example measurements and "Screening Tool Data Entry.xls" for automated calculations.

Note: Lat/Long obtained from Google Earth near middle of site.

Form 1 Table 1. Initial desktop analysis in GIS.

	Symbol	Variable	Description and Source	Value
Watershed properties (English units)	**A**	Area (mi^2)	Contributing drainage area to screening location via published Hydrologic Unit Codes (HUCs) and/or ≤ 30 m National Elevation Data (NED), USGS seamless server	See attached Form 1 table on next page for calculated values for each reach.
	P	Mean annual precipitation (in)	Area-weighted annual precipitation via USGS delineated polygons using records from 1900 to 1960 (which was more significant in hydrologic models than polygons delineated from shorter record lengths)	
Site properties (SI units)	**S_v**	Valley slope (m/m)	Valley slope at site via NED, measured over a relatively homogenous valley segment as dictated by hillslope configuration, tributary confluences, etc., over a distance of up to ~500 m or 10% of the main-channel length from site to drainage divide	
	W_v	Valley width (m)	Valley bottom width at site between natural valley walls as dictated by clear breaks in hillslope on NED raster, irrespective of potential armoring from floodplain encroachment, levees, etc. (imprecise measurements have negligible effect on rating in wide valleys where VWI is >> 2, as defined in lateral decision tree)	

Form 1 Table 2. Simplified peak flow, screening index, and valley width index. Values for this table should be calculated in the sequence shown in this table, using values from Form 1 Table 1.

Symbol	Dependent Variable	Equation	Required Units	Value
Q_{10cfs}	10-yr peak flow (ft^3/s)	$Q_{10cfs} = 18.2 * A^{0.87} * P^{0.77}$	A (mi^2) P (in)	See attached Form 1 table on next page for calculated values for each reach.
Q_{10}	10-yr peak flow (m^3/s)	$Q_{10} = 0.0283 * Q_{10cfs}$	Q_{10cfs} (ft^3/s)	
INDEX	10-yr screening index ($m^{1.5}/s^{0.5}$)	$INDEX = S_v * Q_{10}^{0.5}$	Sv (m/m) Q_{10} (m^3/s)	
W_{ref}	Reference width (m)	$W_{ref} = 6.99 * Q_{10}^{0.438}$	Q_{10} (m^3/s)	
VWI	Valley width index (m/m)	$VWI = W_v/W_{ref}$	W_v (m) W_{ref} (m)	

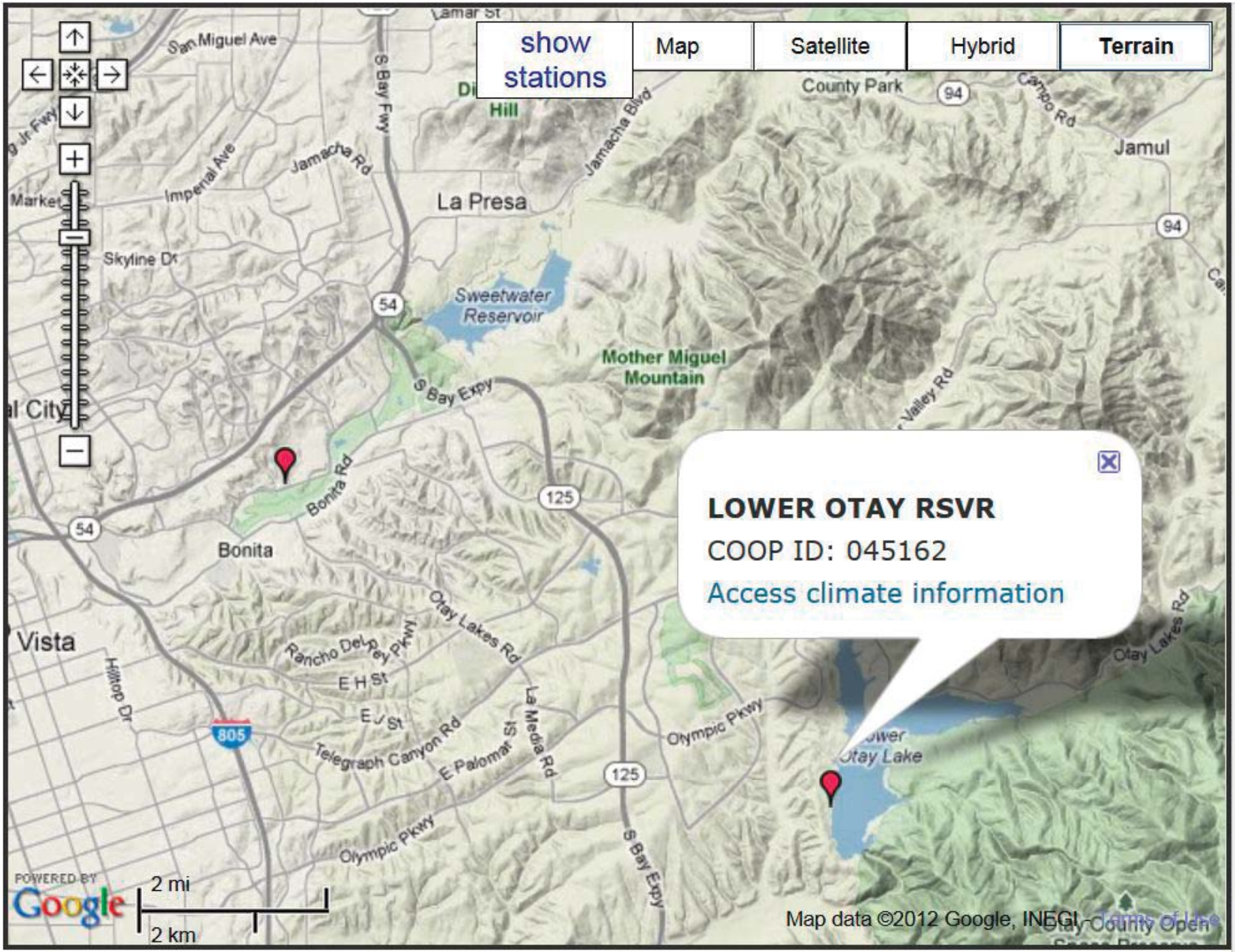
(Sheet 1 of 1)

SCCWRP FORM 1 ANALYSES

Reach	Area A, sq. mi.	Mean Annual Precip. P, inches	Valley Slope Sv, m/m	Valley Width Wv, m	10-Year Flow Q10cfs, cfs	10-Year Flow Q10, cms
W1	0.21	11.07	0.0145	12.2	29	0.8
W2	0.35	11.07	0.0138	10.7	47	1.3
W3	0.36	11.07	0.0122	12.2	47	1.3
W4	0.41	11.07	0.0115	15.8	53	1.5
W5	0.73	11.07	0.0053	18.3	88	2.5
W6	0.75	11.07	0.0220	17.0	90	2.5
C1	1.06	11.07	0.0230	9.1	122	3.5
C2	1.08	11.07	0.0164	12.5	124	3.5
C3	1.08	11.07	0.0129	12.2	124	3.5
C4	1.15	11.07	0.0081	15.2	131	3.7
C5	1.15	11.07	0.0188	24.4	131	3.7
E1	0.27	11.07	0.0164	13.4	37	1.0
E2	0.28	11.07	0.0214	9.8	38	1.1
E3	0.30	11.07	0.0186	13.7	40	1.1
E4	0.40	11.07	0.0141	10.4	52	1.5
E5	0.41	11.07	0.0212	9.1	53	1.5

Reach	10-Year Screening Index INDEX	Reference Width Wref, m	Valley Width Index VWI, m/m
W1	0.013	6.4	1.90
W2	0.016	7.9	1.35
W3	0.014	8.0	1.53
W4	0.014	8.3	1.90
W5	0.008	10.4	1.75
W6	0.035	10.5	1.61
C1	0.043	12.0	0.76
C2	0.031	12.1	1.03
C3	0.024	12.1	1.01
C4	0.016	12.4	1.23
C5	0.036	12.4	1.96
E1	0.017	7.1	1.89
E2	0.022	7.2	1.36
E3	0.020	7.4	1.85
E4	0.017	8.3	1.25
E5	0.026	8.3	1.10

Western US COOP Station Map



LOWER OTAY RESERVOIR, CALIFORNIA (045162)

Period of Record Monthly Climate Summary

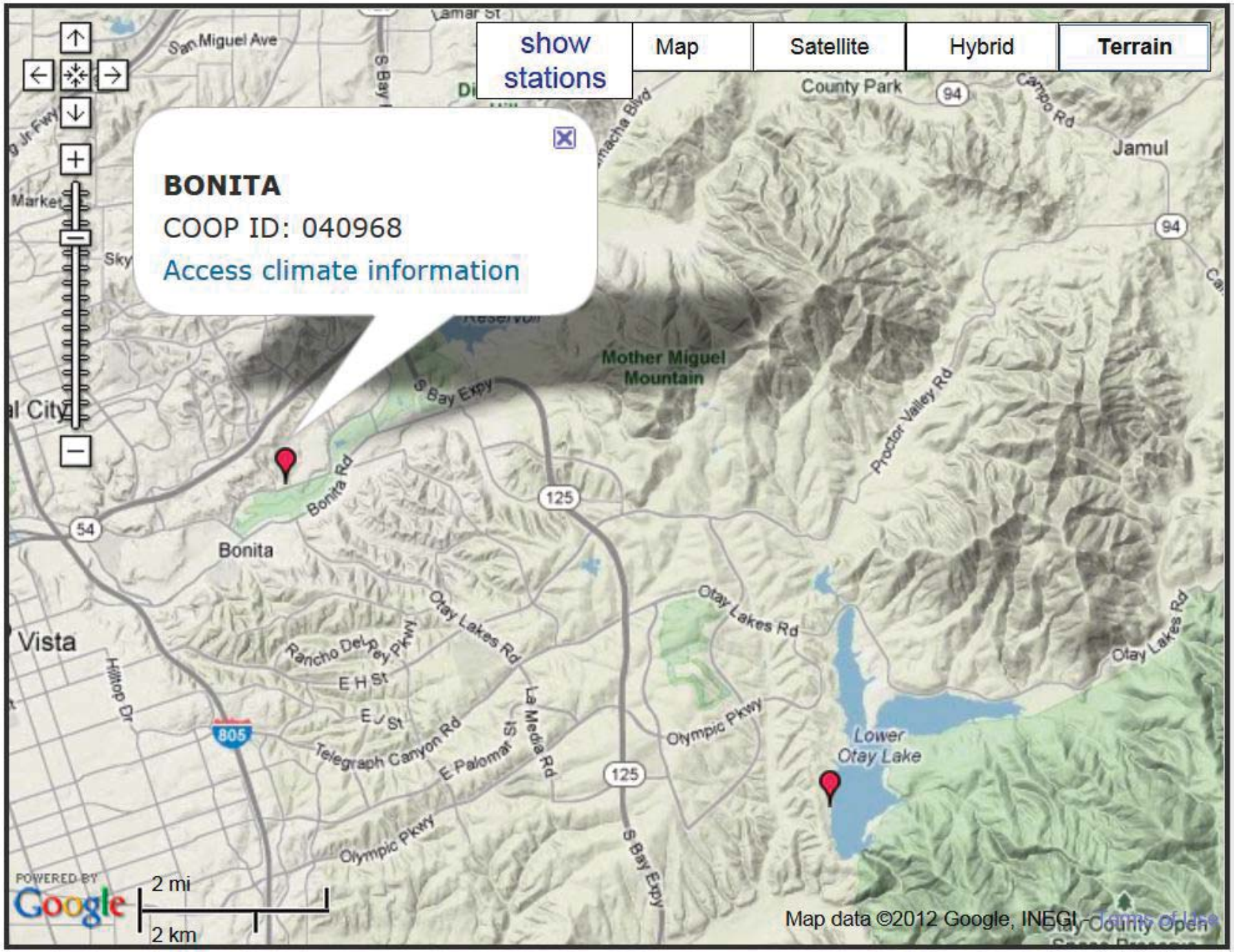
Period of Record : 9/ 1/1940 to 10/31/1956

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)					Insuff	icient	Data						
Average Min. Temperature (F)					Insuff	icient	Data						
Average Total Precipitation (in.)	2.12	1.16	2.28	1.09	0.32	0.03	0.02	0.10	0.03	0.48	0.97	2.46	11.07
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 0% Min. Temp.: 0% Precipitation: 100% Snowfall: 100% Snow Depth: 100%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Western US COOP Station Map



BONITA, CALIFORNIA (040968)

Period of Record Monthly Climate Summary

Period of Record : 10/1/1915 to 12/31/1970

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	66.4	67.3	68.6	70.9	72.6	75.0	79.4	80.8	80.6	77.0	73.5	68.4	73.4
Average Min. Temperature (F)	40.0	42.2	44.2	48.2	52.6	55.9	59.6	60.7	57.5	51.6	44.3	40.9	49.8
Average Total Precipitation (in.)	2.14	2.09	1.75	0.97	0.36	0.06	0.01	0.06	0.18	0.55	1.09	2.25	11.51
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	1	0	0

Percent of possible observations for period of record.
Max. Temp.: 92.5% Min. Temp.: 92.6% Precipitation: 94% Snowfall: 93.6% Snow Depth: 93.3%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Smart Level Measurement of Ground Slope in Study Reach W6

APPENDIX B

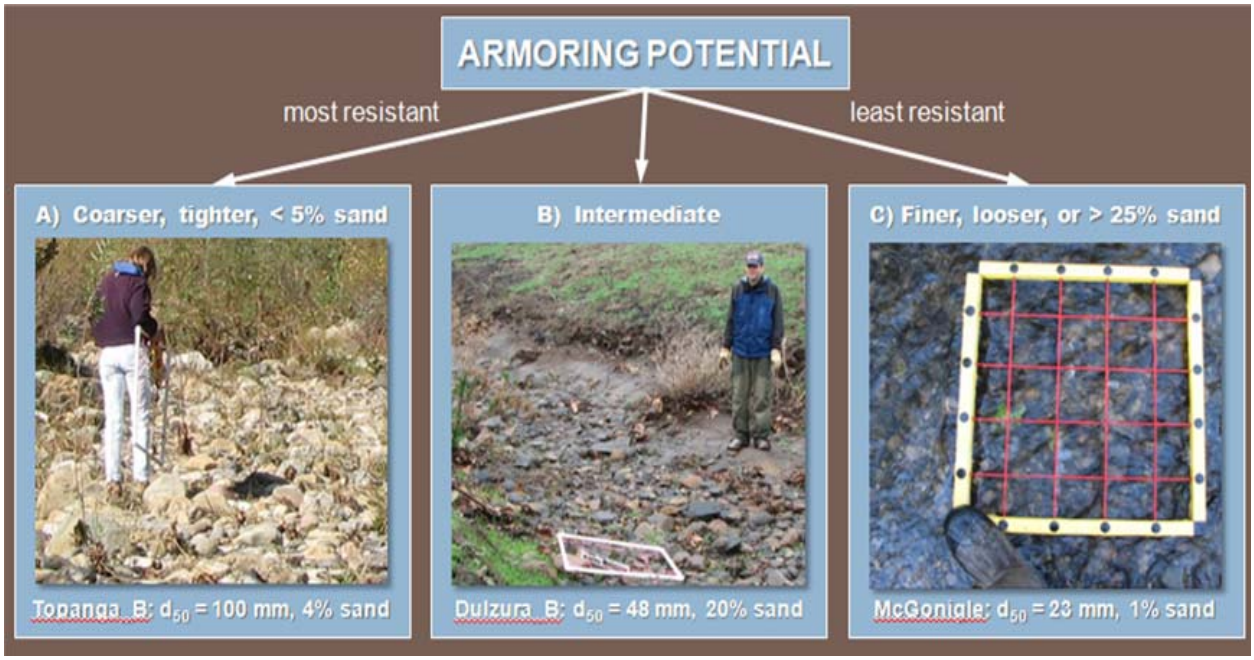
SCCWRP FIELD SCREENING DATA

Form 3 Support Materials

Form 3 Checklists 1 and 2, along with information recording in Form 3 Table 1, are intended to support the decisions pathways illustrated in Form 3 Overall Vertical Rating for Intermediate/Transitional Bed.

Form 3 Checklist 1: Armoring Potential

□	A	A mix of coarse gravels and cobbles that are tightly packed with <5% surface material of diameter <2 mm
X	B	Intermediate to A and C or hardpan of unknown resistance, spatial extent (longitudinal and depth), or unknown armoring potential due to surface veneer covering gravel or coarser layer encountered with probe
□	C	Gravels/cobbles that are loosely packed or >25% surface material of diameter <2 mm



Form 3 Figure 2. Armoring potential photographic supplement for assessing intermediate beds (16 < d_{50} < 128 mm) to be used i**n conjunction with Form 3 Checklist 1.**

RESULTS FOR ALL STUDY REACHES IN WEST, CENTRAL, AND EAST STREAMS

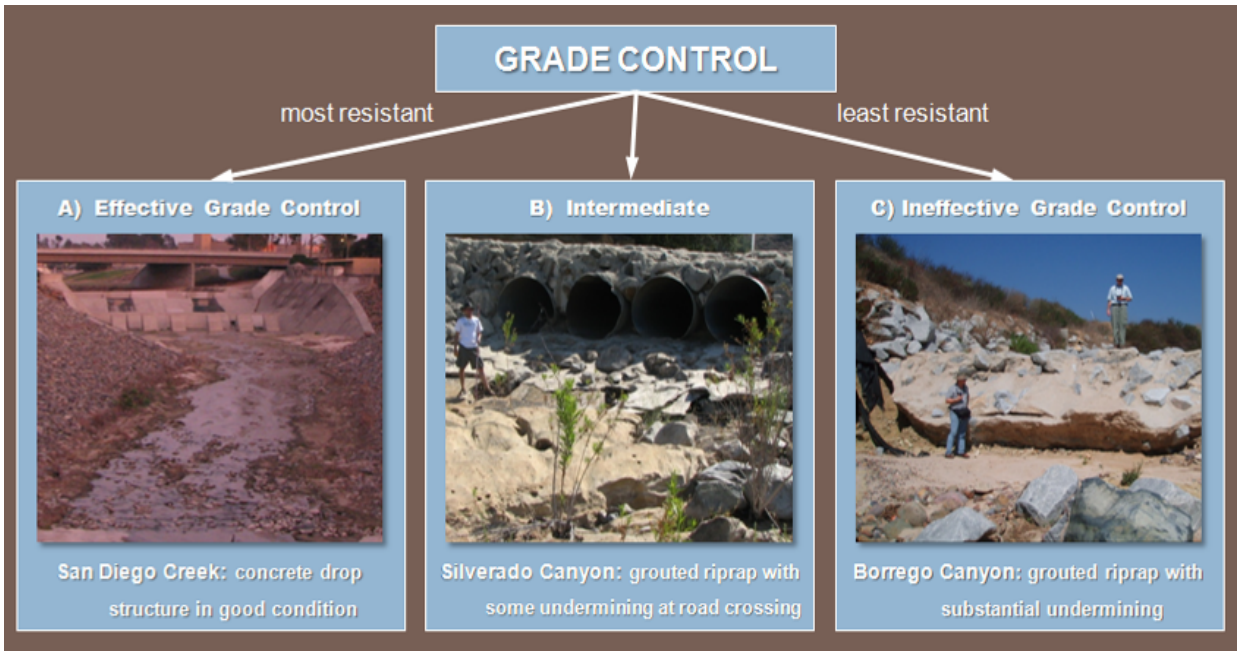
Form 3 Checklist 2: Grade Control

□ A Grade control is present with spacing <50 m or $2/S_v$ m

- No evidence of failure/ineffectiveness, e.g., no headcutting (>30 cm), no active mass wasting (analyst cannot say grade control sufficient if mass-wasting checklist indicates presence of bank failure), no exposed bridge pilings, no culverts/structures undermined
- Hard points in serviceable condition at decadal time scale, e.g., no apparent undermining, flanking, failing grout
- If geologic grade control, rock should be resistant igneous and/or metamorphic; For sedimentary/hardpan to be classified as 'grade control', it should be of demonstrable strength as indicated by field testing such as hammer test/borings and/or inspected by appropriate stakeholder

☒ B Intermediate to A and C – artificial or geologic grade control present but spaced 2/Sv m to 4/Sv m or potential evidence of failure or hardpan of uncertain resistance

□ C Grade control absent, spaced >100 m or $>4/S_v$ m, or clear evidence of ineffectiveness

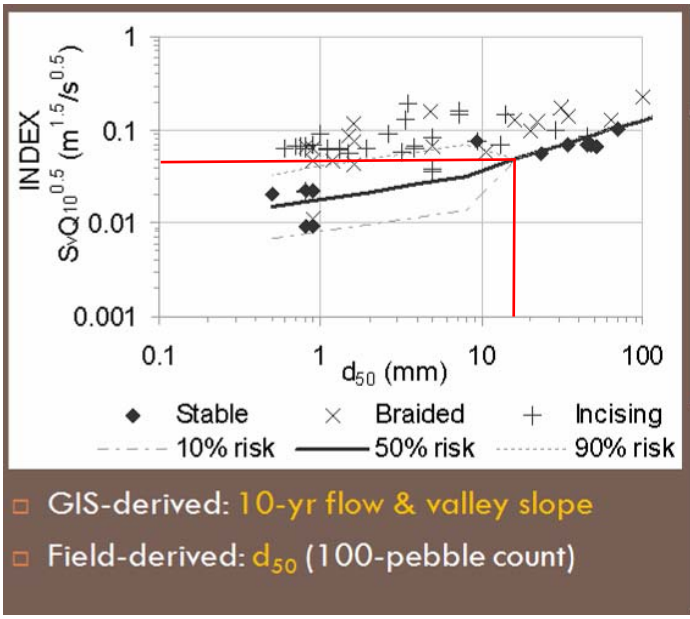


Form 3 Figure 3. Grade-control (condition) photographic supplement for assessing intermediate beds ($16 < d_{50} < 128$ mm) to be used in conjunction with Form 3 Checklist 2.

Regionally-Calibrated Screening Index Threshold for Incising/Braiding

For transitional bed channels (d_{50} between 16 and 128 mm) or labile beds (channel not incised past critical bank height), use Form 3 Figure 3 to determine Screening Index Score and complete Form 3 Table 1.

The 50% probability value is plotted for d50 = 16 mm (0.049).



Model Type	d_{50} (mm)	50% Risk $S_vQ_{10}^{0.5}$ ($m^{1.5}/s^{0.5}$)
Logistic Regression $d_{50} \geq 16$ mm	128	0.145
	96	0.125
	80	0.114
	64	0.101
	48	0.087
	32	0.070
	16	0.049
Logistic Reg. $d_{50} < 16$ mm	8	0.031
	4	0.026
	2	0.022
	1	0.018
	0.5	0.015

Form 3 Figure 4. Probability of incising/braiding based on logistic regression of Screening Index and d_{50} to be used in conjunction with Form 3 Table 1.

Form 3 Table 1. Values for Screening Index Threshold (probability of incising/braiding) to be used in conjunction with Form 3 Figure 4 (above) to complete Form 3 Overall Vertical Rating for Intermediate/Transitional Bed (below).. Screening Index Score: A = <50% probability of incision for current Q_{10}, valley slope, and d_{50}; B = Hardpan/d_{50} indeterminate; and C = ≥50% probability of incising/braiding for current Q_{10}, valley slope, and d_{50}.

d_{50} (mm) *From Form 2*	**$S_v*Q_{10}^{0.5}$ ($m^{1.5}/s^{0.5}$)** *From Form 1*	**$S_v*Q_{10}^{0.5}$ ($m^{1.5}/s^{0.5}$)** *50% risk of incising/braiding from table in Form 3 Figure 3 above*	**Screening Index Score (A, B, C)**

Overall Vertical Rating for Intermediate/Transitional Bed

Calculate the overall Vertical Rating for Transitional Bed channels using the formula below. Numeric values for responses to Form 3 Checklists and Table 1 as follows: A = 3, B = 6, C = 9.

$$Vertical\ Rating = \sqrt{\{(\sqrt{armoring} * grade\ control) * screening\ index\ score\}}$$

6 x 6 x 3 = 4.2

Vertical Susceptibility based on Vertical Rating: <4.5 = LOW; 4.5 to 7 = MEDIUM; and >7 = HIGH.

WEST STREAM PEBBLE COUNT

#	Reach W1 Diameter, mm	Reach W2 Diameter, mm	Reach W3 Diameter, mm	Reach W4 Diameter, mm	Reach W5 Diameter, mm	Reach W6 Diameter, mm	
1	2.8	2.8	2.8	2	2	5.6	
2	2.8	2.8	2.8	2.8	2	8	
3	2.8	2.8	4	4	2.8	8	
4	2.8	2.8	4	4	2.8	16	
5	2.8	4	4	4	2.8	16	
6	2.8	4	5.6	4	2.8	16	
7	2.8	4	5.6	4	2.8	16	
8	4	4	5.6	5.6	2.8	22.6	
9	4	5.6	5.6	5.6	2.8	22.6	
10	4	5.6	5.6	5.6	2.8	22.6	
11	4	5.6	5.6	5.6	2.8	22.6	
12	4	5.6	5.6	5.6	4	22.6	
13	5.6	5.6	5.6	5.6	4	22.6	
14	5.6	5.6	8	5.6	4	22.6	
15	5.6	5.6	8	5.6	4	22.6	
16	5.6	5.6	8	5.6	4	22.6	
17	5.6	5.6	8	8	4	32	
18	5.6	5.6	8	8	4	32	
19	8	5.6	8	8	5.6	32	
20	8	5.6	8	8	5.6	32	
21	8	5.6	8	8	5.6	32	
22	8	5.6	8	11	5.6	32	
23	8	5.6	11	11	5.6	32	
24	8	5.6	11	11	5.6	32	
25	8	5.6	11	11	5.6	32	
26	8	5.6	11	11	5.6	32	
27	8	5.6	11	11	5.6	32	
28	8	5.6	11	11	8	32	
29	8	8	11	11	8	32	
30	8	8	11	11	8	32	
31	8	8	11	11	8	32	
32	8	8	16	11	8	32	
33	11	8	16	11	8	45	
34	11	8	16	11	8	45	
35	11	8	16	11	8	45	
36	11	8	16	11	8	45	
37	11	8	16	11	8	45	
38	11	11	16	11	8	45	
39	11	11	16	16	8	45	
40	11	11	16	16	8	45	
41	11	11	16	16	8	45	
42	11	11	16	16	8	45	
43	11	11	16	16	11	45	
44	11	11	16	16	11	45	
45	11	11	16	16	11	45	
46	16	11	16	16	11	45	
47	16	11	16	16	11	45	
48	16	11	16	16	16	45	
49	16	16	16	16	16	45	
50	16	16	16	16	16	45	D50
51	16	16	16	16	16	64	
52	16	16	16	16	16	64	
53	16	16	16	16	16	64	
54	16	16	16	16	16	64	
55	16	16	16	16	16	64	
56	16	16	16	16	16	64	

#	Reach W1 Diameter, mm	Reach W2 Diameter, mm	Reach W3 Diameter, mm	Reach W4 Diameter, mm	Reach W5 Diameter, mm	Reach W6 Diameter, mm
57	16	16	16	16	16	64
58	16	16	16	16	16	64
59	16	16	16	16	16	64
60	16	16	16	16	16	64
61	16	16	16	16	16	64
62	16	16	16	16	16	64
63	16	16	16	16	16	64
64	16	16	16	16	22.6	64
65	16	16	16	16		64
66	16	16	16	16	22.6	64
67	16	16	16	16	22.6	64
68	16	16	22.6	22.6	22.6	64
69	16	16	22.6	22.6	22.6	90
70	22.6	16	22.6	22.6	22.6	90
71	22.6	16	22.6	22.6	22.6	90
72	22.6	16	22.6	32	22.6	90
73	22.6	16	22.6	32	22.6	90
74	22.6	16	22.6	32	22.6	90
75	22.6	16	22.6	32	22.6	90
76	22.6	16	22.6	32	22.6	90
77	22.6	16	32	32	22.6	90
78	22.6	16	32	32	22.6	90
79	22.6	16	32	32	22.6	90
80	22.6	22.6	32	32	22.6	90
81	22.6	22.6	32	32	22.6	90
82	32	22.6	32	32	22.6	90
83	32	22.6	32	32	32	90
84	32	22.6	32	32	32	90
85	32	22.6	32	32	32	90
86	32	22.6	32	32	32	90
87	32	22.6	32	45	32	90
88	32	22.6	32	45	32	90
89	32	22.6	32	45	32	90
90	32	22.6	32	45	45	90
91	32	22.6	32	45	45	90
92	32	22.6	45	45	45	90
93	32	22.6	45	45	45	90
94	32	22.6	45	45	45	90
95	45	22.6	45	45	45	90
96	45	22.6	45	64	45	90
97	45	22.6	45	64	64	90
98	64	32	64	64	64	90
99	64	45	64	64	64	180
100	64	45	90	64	64	180

CENTRAL STREAM PEBBLE COUNT

#	Reach C1 Diameter, mm	Reach C2 Diameter, mm	Reach C3 Diameter, mm	Reach C4 Diameter, mm	Reach C5 Diameter, mm
1	2	2.8	2	2	5.6
2	2	2.8	2	2	8
3	2.8	4	2.8	2.8	11
4	2.8	4	2.8	2.8	16
5	4	4	2.8	2.8	16
6	4	4	4	2.8	16
7	4	4	4	4	16
8	4	4	4	4	16
9	4	4	4	4	22.6
10	4	4	4	4	22.6
11	5.6	5.6	4	4	22.6
12	5.6	5.6	5.6	4	22.6
13	5.6	5.6	5.6	4	22.6
14	5.6	8	5.6	4	22.6
15	5.6	8	5.6	4	22.6
16	5.6	8	5.6	5.6	22.6
17	5.6	8	8	5.6	22.6
18	5.6	8	8	5.6	32
19	5.6	8	8	5.6	32
20	5.6	8	8	5.6	32
21	5.6	8	8	5.6	32
22	5.6	8	8	5.6	32
23	5.6	8	8	5.6	32
24	5.6	8	8	5.6	32
25	5.6	8	8	5.6	32
26	8	11	8	8	32
27	8	11	8	8	32
28	8	11	8	8	32
29	8	11	8	8	32
30	8	11	8	8	32
31	8	11	11	8	32
32	8	11	11	8	32
33	8	11	11	8	32
34	8	11	11	8	32
35	8	11	11	8	32
36	8	11	11	8	45
37	8	16	11	8	45
38	8	16	11	8	45
39	8	16	11	8	45
40	11	16	11	8	45
41	11	16	11	8	45
42	11	16	11	8	45
43	11	16	11	11	45
44	11	16	11	11	45
45	11	16	11	11	45
46	11	16	11	11	45
47	16	16	11	11	64

#	Reach C1 Diameter, mm	Reach C2 Diameter, mm	Reach C3 Diameter, mm	Reach C4 Diameter, mm	Reach C5 Diameter, mm	
48	16	16	11	22.6	64	
49	16	16	16	22.6	64	
50	16	16	16	22.6	64	D50
51	16	16	16	22.6	64	
52	16	16	16	22.6	64	
53	16	16	16	22.6	64	
54	16	16	16	22.6	64	
55	16	16	16	22.6	64	
56	16	16	16	22.6	64	
57	16	16	16	22.6	64	
58	16	16	16	22.6	64	
59	22.6	16	16	22.6	64	
60	22.6	16	16	22.6	64	
61	22.6	22.6	16	22.6	64	
62	22.6	22.6	16	22.6	64	
63	22.6	22.6	16	22.6	64	
64	22.6	22.6	16	22.6	64	
65	22.6	22.6	16	22.6	64	
66	22.6	22.6	16	22.6	64	
67	22.6	22.6	16	22.6	64	
68	22.6	22.6	22.6	22.6	64	
69	22.6	22.6	22.6	22.6	64	
70	22.6	22.6	22.6	22.6	64	
71	22.6	22.6	22.6	22.6	64	
72	22.6	22.6	22.6	22.6	64	
73	22.6	22.6	22.6	22.6	64	
74	22.6	22.6	22.6	22.6	64	
75	22.6	22.6	32	22.6	64	
76	22.6	22.6	32	22.6	90	
77	22.6	32	32	22.6	90	
78	22.6	32	32	22.6	90	
79	22.6	32	32	22.6	90	
80	22.6	32	32	22.6	90	
81	22.6	32	32	32	90	
82	32	32	32	32	90	
83	32	32	32	32	90	
84	32	32	32	32	90	
85	32	32	32	32	90	
86	32	32	32	32	90	
87	32	32	32	32	90	
88	32	32	32	32	90	
89	32	32	32	32	90	
90	32	32	45	32	90	
91	32	32	45	45	90	
92	32	32	45	45	90	
93	32	45	45	45	90	
94	32	45	45	45	90	
95	32	45	45	45	90	
96	32	45	64	45	90	

#	Reach C1 Diameter, mm	Reach C2 Diameter, mm	Reach C3 Diameter, mm	Reach C4 Diameter, mm	Reach C5 Diameter, mm
97	32	45	64	64	90
98	32	64	64	64	90
99	45	64	64	64	180
100	45	64	64	90	180

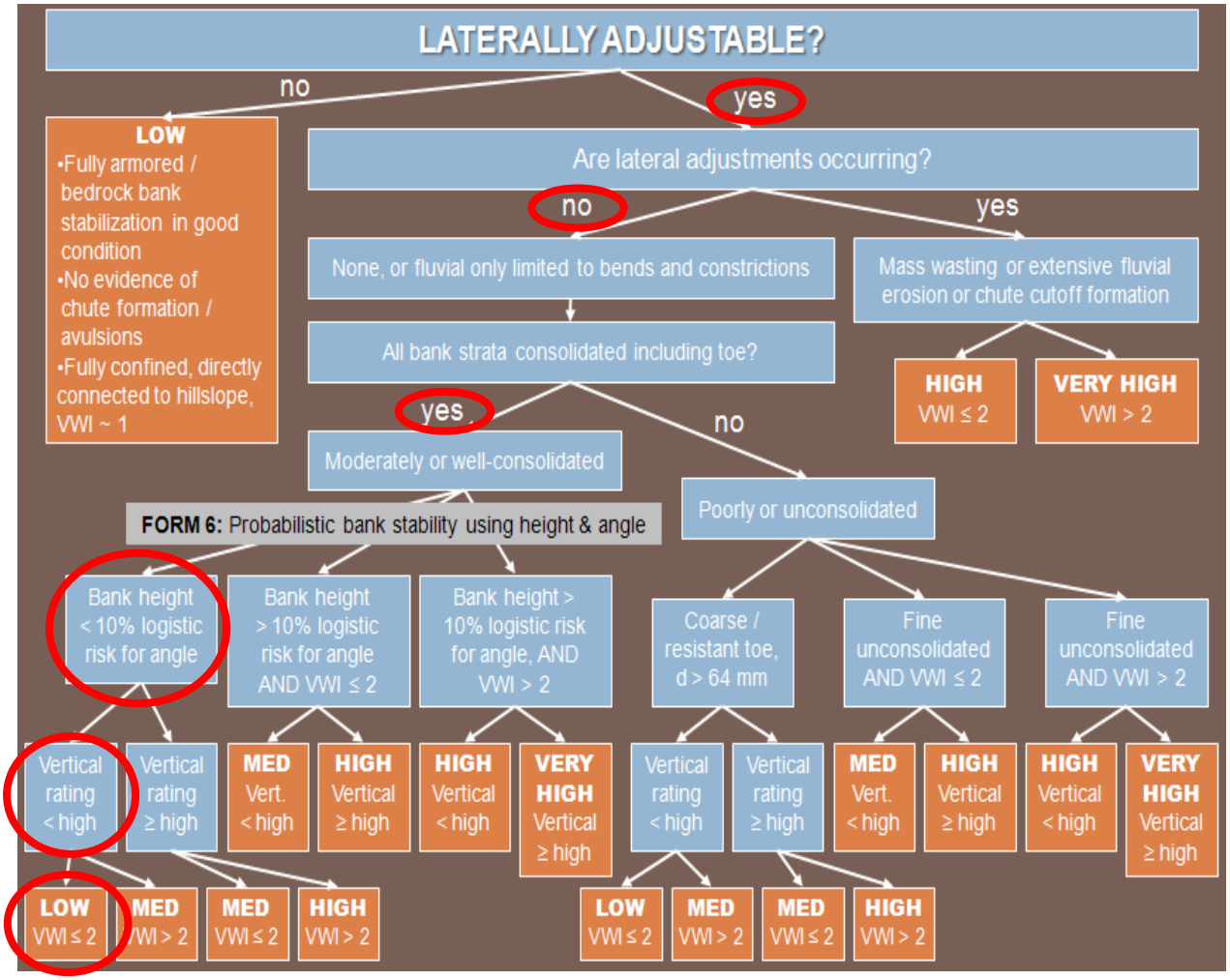
EAST STREAM PEBBLE COUNT

#	Reach E1 Diameter, mm	Reach E2 Diameter, mm	Reach E3 Diameter, mm	Reach E4 Diameter, mm	Reach E5 Diameter, mm
1	2.8	2	2	2	5.6
2	2.8	2.8	2	2.8	5.6
3	2.8	2.8	2	2.8	5.6
4	4	2.8	2.8	2.8	5.6
5	4	4	2.8	2.8	11
6	5.6	4	2.8	2.8	11
7	5.6	4	2.8	4	16
8	5.6	4	2.8	4	16
9	5.6	4	2.8	4	16
10	5.6	4	4	4	16
11	5.6	4	4	4	16
12	5.6	4	4	4	16
13	5.6	5.6	4	4	16
14	5.6	5.6	4	4	22.6
15	8	5.6	5.6	4	22.6
16	8	5.6	5.6	4	22.6
17	8	5.6	5.6	4	32
18	8	5.6	5.6	4	32
19	8	5.6	8	4	32
20	8	5.6	8	4	32
21	8	5.6	8	5.6	32
22	8	5.6	8	5.6	32
23	8	5.6	8	5.6	32
24	8	5.6	8	5.6	32
25	11	5.6	8	5.6	32
26	11	5.6	11	8	32
27	11	5.6	11	8	32
28	11	8	11	8	32
29	11	8	11	8	32
30	11	8	11	8	32
31	11	8	11	8	32
32	11	8	11	8	45
33	11	8	11	8	45
34	11	8	11	8	45
35	11	8	11	8	45
36	16	8	16	8	45
37	16	8	16	8	45
38	16	11	16	8	45
39	16	11	16	8	45
40	16	11	16	8	45
41	16	11	16	8	45
42	16	11	16	8	45
43	16	11	16	8	45
44	16	11	16	8	45
45	16	11	16	11	45
46	16	11	16	11	45
47	16	11	16	11	64
48	16	16	16	16	64
49	16	16	16	16	64

#	Reach E1 Diameter, mm	Reach E2 Diameter, mm	Reach E3 Diameter, mm	Reach E4 Diameter, mm	Reach E5 Diameter, mm	
50	22.6	16	16	16	64	D50
51	22.6	16	16	16	64	
52	22.6	16	22.6	16	64	
53	22.6	16	22.6	16	64	
54	22.6	16	22.6	16	64	
55	22.6	16	22.6	16	64	
56	22.6	16	22.6	16	64	
57	22.6	16	22.6	16	64	
58	22.6	16	22.6	16	64	
59	22.6	16	22.6	16	90	
60	22.6	16	22.6	22.6	90	
61	22.6	16	22.6	22.6	90	
62	22.6	16	22.6	22.6	90	
63	22.6	16	22.6	22.6	90	
64	22.6	16	22.6	22.6	90	
65	22.6	16	22.6	22.6	90	
66	22.6	16	22.6	22.6	90	
67	22.6	16	22.6	22.6	90	
68	22.6	16	22.6	22.6	90	
69	22.6	22.6	22.6	22.6	90	
70	22.6	22.6	22.6	22.6	90	
71	22.6	22.6	22.6	22.6	90	
72	22.6	22.6	22.6	22.6	90	
73	32	22.6	22.6	22.6	90	
74	32	22.6	22.6	22.6	90	
75	32	22.6	22.6	22.6	90	
76	32	22.6	22.6	22.6	90	
77	32	22.6	22.6	22.6	90	
78	32	22.6	22.6	22.6	120	
79	32	22.6	22.6	22.6	120	
80	32	22.6	22.6	32	120	
81	32	22.6	22.6	32	120	
82	32	22.6	22.6	32	120	
83	32	32	22.6	32	120	
84	32	32	22.6	32	120	
85	32	32	32	32	120	
86	32	32	32	32	120	
87	32	32	32	32	120	
88	32	32	32	32	120	
89	32	32	32	32	120	
90	45	32	32	32	120	
91	45	32	32	32	120	
92	45	32	32	32	120	
93	45	32	32	45	120	
94	45	32	32	45	120	
95	45	32	32	45	120	
96	45	32	32	45	120	
97	45	45	32	64	120	
98	45	45	45	64	120	
99	64	45	45	64	180	
100	64	64	45	64	180	

FORM 4: LATERAL SUSCEPTIBILTY FIELD SHEET

Circle appropriate nodes/pathway for proposed site
OR use sequence of questions provided in Form 5.



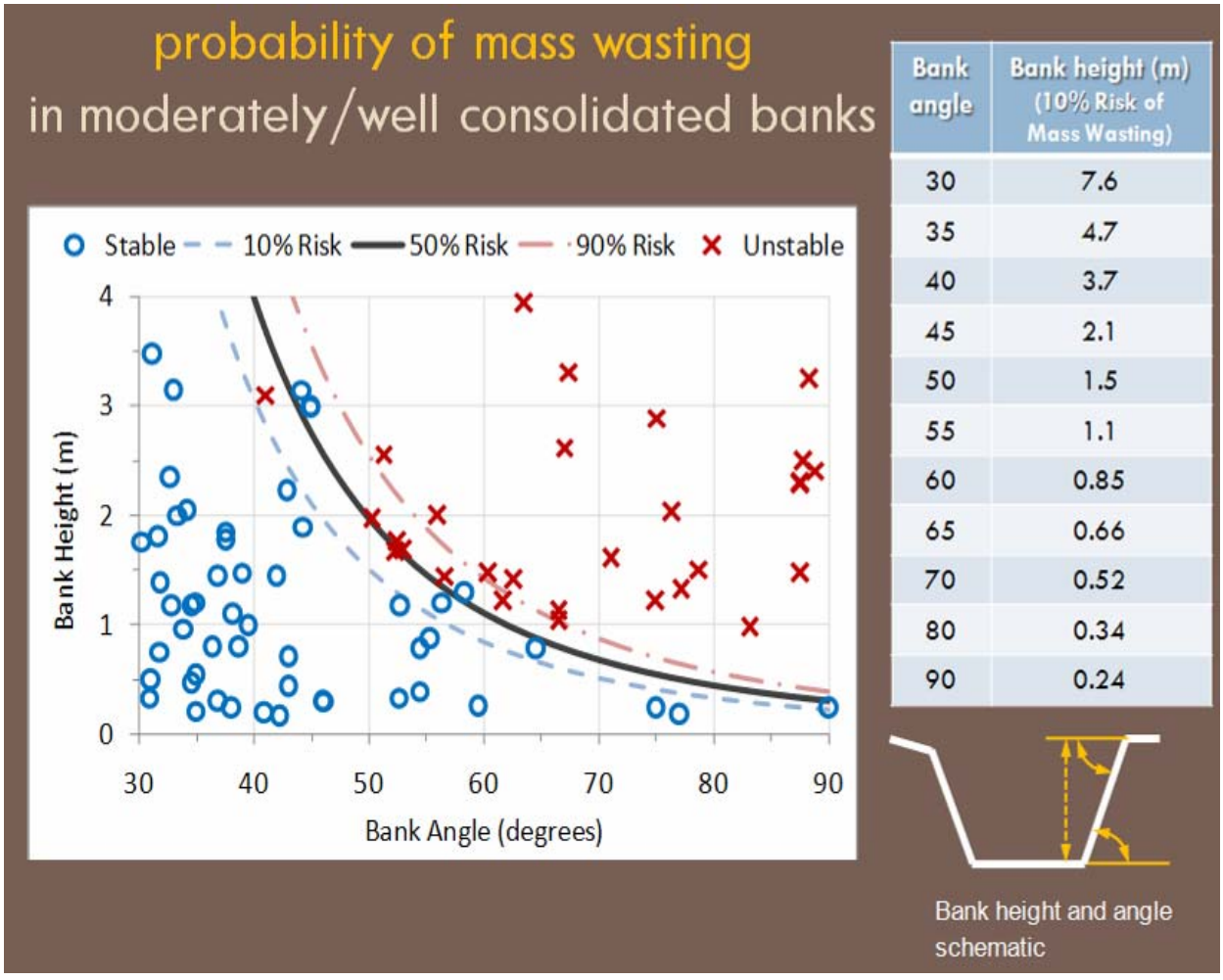
(Sheet 1 of 1)

RESULTS FOR ALL STUDY REACHES IN WEST, CENTRAL, AND EAST STREAMS

FORM 6: PROBABILITY OF MASS WASTING BANK FAILURE

If mass wasting is not currently extensive and the banks are moderately- to well-consolidated, measure bank height and angle at several locations (i.e., at least three locations that capture the range of conditions present in the study reach) to estimate representative values for the reach. Use Form 6 Figure 1 below to determine if risk of bank failure is >10% and complete Form 6 Table 1. Support your results with photographs that include a protractor/rod/tape/person for scale.

	Bank Angle (degrees) *(from Field)*	**Bank Height (m)** *(from Field)*	**Corresponding Bank Height for 10% Risk of Mass Wasting (m)** *(from Form 6 Figure 1 below)*	**Bank Failure Risk** *(<10% Risk)* *(>10% Risk)*
Left Bank	<30	---	---	<10%
Right Bank	<30	---	---	<10%



Form 6 Figure 1. Probability Mass Wasting diagram, Bank Angle:Height/% Risk table, and Band Height:Angle schematic.

uKnow San Diego BMP Sizing Calculator (v3.0) Home Contacts Legal Logout

Find

Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH W1

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility: LOW

Low Flow Threshold: 0.5Q2

Cancel Save Update

Channel Assessed: Yes

Watershed Area (ac): 131.29

Vertical Susceptibility: Low (Vertical)

Lateral Susceptibility: Low (Lateral)

Material: Vegetation

Roughness: 0.100

Channel Top Width (ft): 40.0

Channel Bottom Width (ft): 20.0

Channel Height (ft): 0.5

Channel Slope: 0.0145

Large View

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Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH W2

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility: LOW

Low Flow Threshold: 0.5Q2

Cancel Save Update

Channel Assessed: Yes

Watershed Area (ac): 225.06

Vertical Susceptibility: Low (Vertical)

Lateral Susceptibility: Low (Lateral)

Material: Vegetation

Roughness: 0.100

Channel Top Width (ft): 35.0

Channel Bottom Width (ft): 20.0

Channel Height (ft): 0.5

Channel Slope: 0.0138

Large View

Find

Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH W3

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility:	LOW
Low Flow Threshold:	0.5Q2

Cancel Save Update

Channel Assessed:	Yes	Vertical Susceptibility:	Low (Vertical)
Watershed Area (ac):	229.14	Lateral Susceptibility:	Low (Lateral)

Material:	Vegetation
Roughness:	0.100
Channel Top Width (ft):	40
Channel Bottom Width (ft):	15
Channel Height (ft):	0.5
Channel Slope:	0.0122

Large View

Find

Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH W4

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility:	LOW
Low Flow Threshold:	0.5Q2

Cancel Save Update

Channel Assessed:	Yes	Vertical Susceptibility:	Low (Vertical)
Watershed Area (ac):	259.49	Lateral Susceptibility:	Low (Lateral)

Material:	Vegetation
Roughness:	0.100
Channel Top Width (ft):	52.0
Channel Bottom Width (ft):	24.0
Channel Height (ft):	0.5
Channel Slope:	0.0115

Large View

uKnow San Diego BMP Sizing Calculator (v3.0) Home Contacts Legal Logout

Find

Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH W5

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility:	LOW
Low Flow Threshold:	0.5Q2

Cancel Save Update

Channel Assessed:	Yes	Vertical Susceptibility:	Low (Vertical)
Watershed Area (ac):	467.84	Lateral Susceptibility:	Low (Lateral)

Material:	Vegetation
Roughness:	0.100
Channel Top Width (ft):	60.0
Channel Bottom Width (ft):	50.0
Channel Height (ft):	0.5
Channel Slope:	0.0053

Large View

Find

Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH W6

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility:	LOW
Low Flow Threshold:	0.5Q2

Cancel Save Update

Channel Assessed:	Yes	Vertical Susceptibility:	Low (Vertical)
Watershed Area (ac):	478.68	Lateral Susceptibility:	Low (Lateral)

Material:	Vegetation
Roughness:	0.100
Channel Top Width (ft):	54.0
Channel Bottom Width (ft):	48.0
Channel Height (ft):	0.5
Channel Slope:	0.0220

Large View

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Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH C1

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility:	LOW
Low Flow Threshold:	0.5Q2

Cancel Save Update

Channel Assessed:	Yes	Vertical Susceptibility:	Low (Vertical)
Watershed Area (ac):	680.91	Lateral Susceptibility:	Low (Lateral)

Material:	Vegetation
Roughness:	0.100
Channel Top Width (ft):	30.0
Channel Bottom Width (ft):	20.0
Channel Height (ft):	2.0
Channel Slope:	0.0230

Large View

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Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH C2

Define Drainage Basins

Basin: **Unnamed Tributary**

Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility: LOW

Low Flow Threshold: 0.5Q2

Cancel Save Update

Channel Assessed: Yes

Watershed Area (ac): 691.30

Vertical Susceptibility: Low (Vertical)

Lateral Susceptibility: Low (Lateral)

Material: Vegetation

Roughness: 0.100

Channel Top Width (ft): 35.0

Channel Bottom Width (ft): 10.0

Channel Height (ft): 3.0

Channel Slope: 0.0164

Large View

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Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH C3

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility: LOW

Low Flow Threshold: 0.5Q2

Cancel Save Update

Channel Assessed: Yes

Watershed Area (ac): 694.26

Vertical Susceptibility: Low (Vertical)

Lateral Susceptibility: Low (Lateral)

Material: Vegetation

Roughness: 0.100

Channel Top Width (ft): 35.0

Channel Bottom Width (ft): 10.0

Channel Height (ft): 3.0

Channel Slope: 0.0129

Large View

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Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH C4

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility: LOW

Low Flow Threshold: 0.5Q2

Cancel Save Update

Channel Assessed: Yes

Watershed Area (ac): 733.56

Vertical Susceptibility: Low (Vertical)

Lateral Susceptibility: Low (Lateral)

Material: Vegetation

Roughness: 0.100

Channel Top Width (ft): 44.0

Channel Bottom Width (ft): 24.0

Channel Height (ft): 2.0

Channel Slope: 0.0081

Large View

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Find

Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH C5

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility:	LOW
Low Flow Threshold:	0.5Q2

Cancel Save Update

Channel Assessed:	Yes	Vertical Susceptibility:	Low (Vertical)
Watershed Area (ac):	737.80	Lateral Susceptibility:	Low (Lateral)

Material:	Vegetation
Roughness:	0.100
Channel Top Width (ft):	80.0
Channel Bottom Width (ft):	50.0
Channel Height (ft):	1.0
Channel Slope:	0.0188

Large View

Find

Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH E1

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility:	LOW
Low Flow Threshold:	0.5Q2

Cancel Save Update

Channel Assessed:	Yes	Vertical Susceptibility:	Low (Vertical)
Watershed Area (ac):	170.49	Lateral Susceptibility:	Low (Lateral)

Material:	Vegetation
Roughness:	0.100
Channel Top Width (ft):	44.0
Channel Bottom Width (ft):	30.0
Channel Height (ft):	1.0
Channel Slope:	0.0164

Large View

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Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH E2

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility:	LOW
Low Flow Threshold:	0.5Q2

Cancel Save Update

Channel Assessed:	Yes	Vertical Susceptibility:	Low (Vertical)
Watershed Area (ac):	176.36	Lateral Susceptibility:	Low (Lateral)

Material:	Vegetation
Roughness:	0.100
Channel Top Width (ft):	32.0
Channel Bottom Width (ft):	15.0
Channel Height (ft):	2.0
Channel Slope:	0.0214

Large View

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Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH E3

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility: LOW

Low Flow Threshold: 0.5Q2

Cancel Save Update

Channel Assessed: Yes

Watershed Area (ac): 189.73

Vertical Susceptibility: Low (Vertical)

Lateral Susceptibility: Low (Lateral)

Material: Vegetation

Roughness: 0.100

Channel Top Width (ft): 40.0

Channel Bottom Width (ft): 15.0

Channel Height (ft): 2.0

Channel Slope: 0.0186

Large View

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Find

Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH E4

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Channel Susceptibility: LOW

Low Flow Threshold: 0.5Q2

Cancel Save Update

Channel Assessed: Yes

Watershed Area (ac): 257.53

Vertical Susceptibility: Low (Vertical)

Lateral Susceptibility: Low (Lateral)

Material: Vegetation

Roughness: 0.100

Channel Top Width (ft): 34.0

Channel Bottom Width (ft): 20.0

Channel Height (ft): 1.0

Channel Slope: 0.0141

Large View

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Find

Map data provided by OpenStreetMap

Map **Details**

Result View

CRITICAL STRESS CALCULATOR RESULTS FOR STUDY REACH E5

Define Drainage Basins

Basin: **Unnamed Tributary** Project: **Otay Crossings**

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

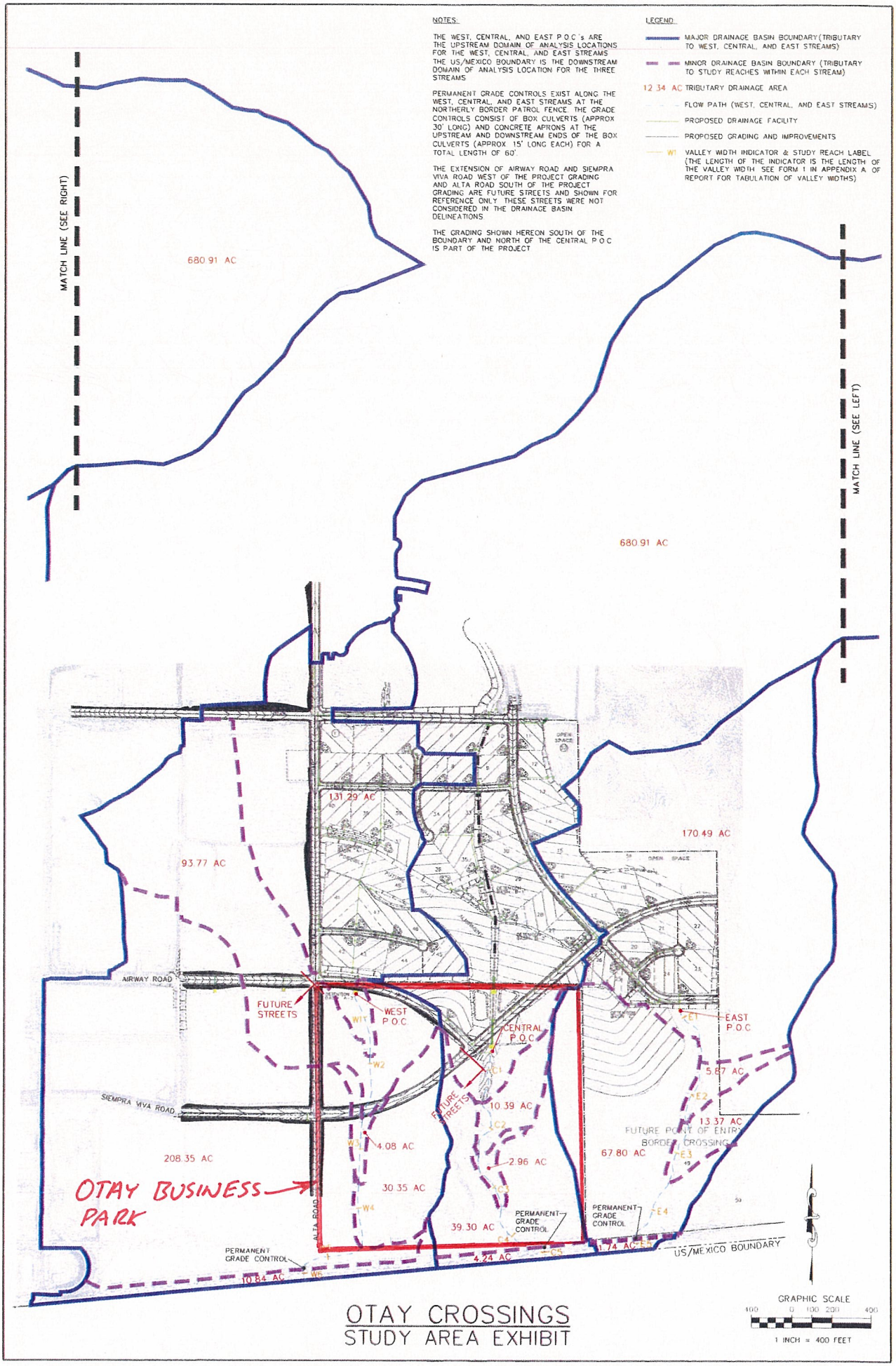
Channel Susceptibility:	LOW
Low Flow Threshold:	0.5Q2

Cancel Save Update

Channel Assessed:	Yes	Vertical Susceptibility:	Low (Vertical)
Watershed Area (ac):	259.27	Lateral Susceptibility:	Low (Lateral)

Material:	Vegetation
Roughness:	0.100
Channel Top Width (ft):	30.0
Channel Bottom Width (ft):	20.0
Channel Height (ft):	1.0
Channel Slope:	0.0212

Large View



OTAY CROSSINGS
STUDY AREA EXHIBIT

ATTACHMENT J

HMP Exemption Documentation

(if applicable)

NOT APPLICABLE

ATTACHMENT K

Addendum

NOT APPLICABLE